**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
*(Established by Govt. of A.P., ACT No.30 of 2008)*
**ANANTHAPURAMU – 515 002 (A.P) INDIA**
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# B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year
**2023-24** onwards)

## CSE (INTERNET OF THINGS)
## IV YEARS COURSE STRUCTURE AND SYLLABUS

**B.TECH. -CSE (INTERNET OF THINGS) – R23**
**(Applicable from the academic year 2023-24 onwards)**

## INDUCTION PROGRAMME

| S.No. | Course Name | Category | L-T-P-C |
|-------|-------------|----------|---------|
| 1 | Physical Activities -- Sports, Yoga and Meditation, Plantation | MC | 0-0-6-0 |
| 2 | Career Counselling | MC | 2-0-2-0 |
| 3 | Orientation to all branches -- career options, tools, etc. | MC | 3-0-0-0 |
| 4 | Orientation on admitted Branch -- corresponding labs, tools and platforms | EC | 2-0-3-0 |
| 5 | Proficiency Modules & Productivity Tools | ES | 2-1-2-0 |
| 6 | Assessment on basic aptitude and mathematical skills | MC | 2-0-3-0 |
| 7 | Remedial Training in Foundation Courses | MC | 2-1-2-0 |
| 8 | Human Values & Professional Ethics | MC | 3-0-0-0 |
| 9 | Communication Skills -- focus on Listening, Speaking, Reading, Writing skills | BS | 2-1-2-0 |
| 10 | Concepts of Programming | ES | 2-0-2-0 |

**B.Tech. – I Year I Semester**

| S.No. | Course code | Title | L/D | T | P | Credits |
|-------|-------------|-------|-----|---|---|---------|
| 1 | 23A56101T | Engineering Physics | 3 | 0 | 0 | 3 |
| 2 | 23A54101 | Linear Algebra & Calculus | 3 | 0 | 0 | 3 |
| 3 | 23A02101T | Basic Electrical & Electronics Engineering | 3 | 0 | 0 | 3 |
| 4 | 23A03101T | Engineering Graphics | 1 | 0 | 4 | 3 |
| 5 | 23A05101T | Introduction to Programming | 3 | 0 | 0 | 3 |
| 6 | 23A05102 | IT Workshop | 0 | 0 | 2 | 1 |
| 7 | 23A56101P | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 8 | 23A02101P | Electrical & Electronics Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 9 | 23A05101P | Computer Programming Lab | 0 | 0 | 3 | 1.5 |
| 10 | 23A99101 | NSS/NCC/Scouts & Guides/Community Service | - | - | 1 | 0.5 |
| | | **Total** | **13** | **00** | **15** | **20.5** |

**B.Tech. – I Year II Semester**

| S.No. | Course code | Title | L | T | P | Credits |
|-------|-------------|-------|---|---|---|---------|
| 1 | 23A52201T | Communicative English | 2 | 0 | 0 | 2 |
| 2 | 23A51202T | Chemistry | 3 | 0 | 0 | 3 |
| 3 | 23A54201 | Differential Equations & Vector Calculus | 3 | 0 | 0 | 3 |
| 4 | 23A01201T | Basic Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |
| 5 | 23A05201T | Data Structures | 3 | 0 | 0 | 3 |
| 6 | 23A52201P | Communicative English Lab | 0 | 0 | 2 | 1 |
| 7 | 23A51202P | Chemistry Lab | 0 | 0 | 2 | 1 |
| 8 | 23A03201 | Engineering Workshop | 0 | 0 | 3 | 1.5 |
| 9 | 23A05201P | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 10 | 23A99201 | Health and wellness, Yoga and Sports | - | - | 1 | 0.5 |
| | | **Total** | **14** | **0** | **11** | **19.5** |

**B. Tech – II Year I Semester**

| S.No. | Course code | Title | L | T | P | Credits |
|-------|-------------|-------|---|---|---|---------|
| 1 | 23A54301 | Discrete Mathematics & Graph Theory | 3 | 0 | 0 | 3 |
| 2 | 23A52301 | Universal Human Values 2- Understanding Harmony and Ethical human conduct | 2 | 1 | 0 | 3 |
| 3 | 23A30402 | Digital Logic and Computer Organization | 3 | 0 | 0 | 3 |
| 4 | 23A05302T | Advanced Data Structures & Algorithms Analysis | 3 | 0 | 0 | 3 |
| 5 | 23A05303T | Object-Oriented Programming Through JAVA | 3 | 0 | 0 | 3 |
| 6 | 23A05302P | Advanced Data Structures and Algorithms Analysis Lab | 0 | 0 | 3 | 1.5 |
| 7 | 23A05303P | Object-Oriented Programming Through JAVA Lab | 0 | 0 | 3 | 1.5 |
| 8 | 23A05304 | Python programming | 0 | 1 | 2 | 2 |
| 9 | 23A99301 | Environmental Science | 2 | 0 | 0 | - |
| | | **Total** | **15** | **2** | **10** | **20** |

**B.Tech– II Year II Semester**

| S.No. | Course code | Title | L | T | P | Credits |
|-------|-------------|-------|---|---|---|---------|
| 1 | 23A52402a<br><br>23A52402b<br>23A52402c | Managerial Economics and Financial Analysis<br>Organizational Behavior<br>Business Environment | 2 | 0 | 0 | 2 |
| 2 | 23A54401 | Probability & Statistics | 3 | 0 | 0 | 3 |
| 3 | 23A35401T | Operating Systems | 3 | 0 | 0 | 3 |
| 4 | 23A04405T | Microprocessors & Microcontrollers | 3 | 0 | 0 | 3 |
| 5 | 23A37401T | Computer Networks | 3 | 0 | 0 | 3 |
| 6 | 23A35403 | Computer Networks &Operating Systems Lab | 0 | 0 | 3 | 1.5 |
| 7 | 23A04405P | Microprocessors & Microcontrollers Lab | 0 | 0 | 3 | 1.5 |
| 8 | 23A52401 | Full Stack Development-1 | 0 | 1 | 2 | 2 |
| 9 | 23A99401 | Design Thinking & Innovation | 1 | 0 | 2 | 2 |
| | | **Total** | **15** | **1** | **12** | **21** |
| | Mandatory Community Service Project Internship of 08 weeks duration during summer vacation | | | | | |

**III B.Tech I Semester (IOT)**

| S.No | Course Code | Title | L | T | P | Credits |
|------|-------------|-------|---|---|---|---------|
| 1 | 23A32503T | Internet of Things | 3 | 0 | 0 | 3 |
| 2 | 23A05402T | Database Management Systems | 3 | 0 | 0 | 3 |
| 3 | 23A35501 | Embedded Systems | 3 | 0 | 0 | 3 |
| 4 | 23A05503 | Introduction To Quantum Technologies And Applications | 3 | 0 | 0 | 3 |
| 5 | 23A32502<br>23A35502<br>23A31301T<br>23A05601T | **Professional Elective-I**<br>1.Software Engineering<br>2.Wireless Sensor Networks & Applications<br>3. Artificial Intelligence<br>4.Cryptography & Network Security | 3 | 0 | 0 | 3 |
| 6 | | **Open Elective- I** | 3 | 0 | 0 | 3 |
| 7 | 23A32503P | Internet of Things Lab | 0 | 0 | 3 | 1.5 |
| 8 | 23A05402P | Database Management Systems Lab | 0 | 0 | 3 | 1.5 |
| 9 | 23A05506 | **Skill Enhancement course**<br>Full Stack development-II | 0 | 1 | 2 | 2 |
| 10 | 23A03508 | Tinkering Lab | 0 | 0 | 2 | 1 |
| 11 | 23A35503 | Evaluation of Community Service Internship | - | - | - | 2 |
| | | **Total** | **18** | **1** | **10** | **26** |

**Open Elective – I**

| S.No. | Course Code | Course Name | Offered by the Dept. |
|-------|-------------|-------------|----------------------|
| 1 | 23A01505a | Green Buildings | CIVIL |
| 2 | 23A01505b | Construction Technology and Management | |
| 3 | 23A02505 | Electrical Safety Practices and Standards | EEE |
| 4 | 23A03505 | Sustainable Energy Technologies | ME |
| 5 | 23A04505 | Electronic Circuits | ECE |
| 6 | 23A05505c | Quantum Technologies And Applications | CSE & Allied |
| 7 | 23A54501 | Mathematics for Machine Learning and AI | Mathematics |
| 8 | 23A56501 | Materials Characterization Techniques | Physics |
| 9 | 23A51501 | Chemistry of Energy Systems | Chemistry |
| 10 | 23A52502a | English for Competitive Examinations | Humanities |
| 11 | 23A52502b | Entrepreneurship and New Venture Creation | |

**Note:**
1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

**III B.Tech II Semester (IOT)**

| S.No | Course Code | Title | L | T | P | Credits |
|------|-------------|-------|---|---|---|---------|
| 1 | 23A35601 | Big Data Analytics for IoT | 3 | 0 | 0 | 3 |
| 2 | 23A37501T | Cloud Computing | 3 | 0 | 0 | 3 |
| 3 | 23A05701b | Blockchain Technology | 3 | 0 | 0 | 3 |
| 4 | 23A05602a<br>23A04503T<br>23A05502<br>23A31401T | **Professional Elective-II**<br>1. Software Testing Methodologies<br>2. Microprocessors & Microcontrollers<br>3. Automata Theory & Compiler Design<br>4. Machine Learning | 3 | 0 | 0 | 3 |
| 5 | 23A32603<br>23A05603b<br>23A31501<br>23A35602 | **Professional Elective-III**<br>1.Introduction to Quantum Computing<br>2.Mobile Adhoc Networks<br>3.Natural Language Processing<br>4.Security Assessment and Risk Analysis | 3 | 0 | 0 | 3 |
| 6 | | **Open Elective – II** | 3 | 0 | 0 | 3 |
| 7 | 23A37501P | Cloud Computing Lab | 0 | 0 | 3 | 1.5 |
| 8 | 23A35603 | Blockchain Technology Lab | 0 | 0 | 3 | 1.5 |
| 9 | 23A52501 | **Skill Enhancement Course**<br>Soft Skills | 0 | 1 | 2 | 2 |
| 10 | 23A52601 | Technical Paper Writing & IPR | 2 | 0 | 0 | - |
| 11 | 23A35604 | Workshop | 0 | 0 | 0 | 0 |
| | | **Total** | **19** | **1** | **06** | **23** |
| | Mandatory Industry Internship of 6 to 8 weeks  duration during summer vacation | | | | | |

**Open Elective – II**

| S.No. | Course Code | Course Name | Offered by the Dept. |
|-------|-------------|-------------|----------------------|
| 1 | 23A01606a | Disaster Management | CIVIL |
| 2 | 23A01606b | Sustainability In Engineering Practices | |
| 3 | 23A02605 | Renewable Energy Sources | EEE |
| 4 | 23A03606 | Automation and Robotics | ME |
| 5 | 23A04606 | Digital Electronics | ECE |
| 6 | 23A54601a | Optimization Techniques for Engineers | Mathematics |
| 7 | 23A54601b | Mathematical Foundation Of Quantum Technologies | |
| 8 | 23A56601 | Physics Of Electronic Materials And Devices | Physics |
| 9 | 23A51601 | Chemistry Of Polymers And Applications | Chemistry |
| 10 | 23A52602 | Academic Writing and Public Speaking | Humanities |

**IV B.Tech I Semester (IOT)**

| S.No | Course Code | Title | L | T | P | Credits |
|------|-------------|-------|---|---|---|---------|
| 1 | 23A35701 | IoT Applications development on Cloud Platform | 3 | 0 | 0 | 3 |
| 2 | 23A52701a 23A52701b 23A52701c | **Management Course- II** 1.Business Ethics and Corporate Governance 2.E-Business 3.Management Science | 2 | 0 | 0 | 2 |
| 3 | 23A35702a 23A35702b 23A35702c 23A05602b | **Professional Elective-IV** 1.Ad-hoc and Sensor Networks 2.Malware Analysis & Reverse Engineering 3.Crypto Currency 4.Devops | 3 | 0 | 0 | 3 |
| 4 | 23A35703a 23A35703b 23A05702b 23A05701c | **Professional Elective-V** 1.Cyber Laws and Security Policies 2.Intrusion Detection and Prevention System 3.Metaverse 4.Augmented Reality & Virtual Reality | 3 | 0 | 0 | 3 |
| 5 | | **Open Elective-III** | 3 | 0 | 0 | 3 |
| 6 | | **Open Elective-IV** | 3 | 0 | 0 | 3 |
| 7 | 23A35704 | **Skill Enhancement Course** Ethical Hacking | 0 | 1 | 2 | 2 |
| 8 | 23A52702 | Gender Sensitization | 2 | 0 | 0 | - |
| 9 | 23A35705 | Evaluation of Industry Internship | - | - | - | 2 |
| | | **Total** | 19 | 1 | 06 | 21 |

**Open Elective – III**

| S.No | Course Code | Course Name | Offered by the Dept. |
|------|-------------|-------------|----------------------|
| 1 | 23A01704a | Building Materials and Services | CIVIL |
| 2 | 23A01704b | Environmental Impact Assessment | |
| 3 | 23A02704 | Smart Grid Technologies | EEE |
| 4 | 23A03704 | 3D Printing Technologies | ME |
| 5 | 23A04503T | Microprocessors and Microcontrollers | ECE |
| 6 | 23A54701 | Wavelet transforms and its Applications | Mathematics |
| 7 | 23A56701a | Smart Materials And Devices | Physics |
| 8 | 23A56701b | Introduction to Quantum Mechanics | |
| 9 | 23A51701 | Green Chemistry And Catalysis For Sustainable Environment | Chemistry |
| 10 | 23A52703 | Employability Skills | Humanities |

**Open Elective – IV**

| S.No | Course Code | Course Name | Offered by the Dept. |
|---|---|---|---|
| 1 | 23A01705a | Geo-Spatial Technologies | CIVIL |
| 2 | 23A01705b | Solid Waste Management | |
| 3 | 23A02705 | Electric Vehicles | EEE |
| 4 | 23A03705 | Total Quality Management | ME |
| 5 | 23A04704 | Transducers and Sensors | ECE |
| 6 | 23A32603 | Introduction to Quantum Computing | CSE & Allied |
| 7 | 23A54702 | Financial Mathematics | Mathematics |
| 8 | 23A56702 | Sensors And Actuators For Engineering Applications | Physics |
| 9 | 23A51702 | Chemistry Of Nanomaterials and Applications | Chemistry |
| | 23A52704 | Literary Vibes | Humanities |

**IV B.Tech II Semester (CSE-IOT)**

| S.No. | Course code | Title | Category | L | T | P | Credits |
|---|---|---|---|---|---|---|---|
| 1 | 23A35801 | Internship | | - | - | - | 4 |
| 2 | 23A35802 | Project | | - | - | - | 8 |
| | | **Total** | | | | | **12** |

**COURSES OFFERED FOR HONOURS DEGREE IN IOT**

| S.No. | Course Code | Course Name | Contact Hours per week | | | Credits |
|---|---|---|---|---|---|---|
| | | | L | T | P | |
| 1 | 23A35H01 | Communication Protocols for IoT | 3 | 0 | 0 | 3 |
| 2 | 23A35H02 | Introduction to UAV | 3 | 0 | 0 | 3 |
| 3 | 23A35H03 | IoT Infrastructure | 3 | 0 | 0 | 3 |
| 4 | 23A35H04 | Industrial IoT | 3 | 0 | 0 | 3 |
| 5 | 23A32H04 | Data Analytics | 3 | 0 | 0 | 3 |
| 6 | 23A35H05 | IoT Communication Protocols Lab | | | 3 | 1.5 |
| 7 | 23A32H05 | Data Analytics Lab | | | 3 | 1.5 |

**I Year B.Tech.  CSE (IOT) – I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# (23A56101) ENGINEERIN GPHYSICS

(Common for all branches of Engineering)

**Course Objectives:**

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

**Course Outcomes:**

CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.
CO2: Familiarize with the basics of crystals and their structures.
CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.
CO6: Identify the type of semiconductor using Hall effect.

**UNIT  I    Wave Optics**
Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

**UNIT  II Crystallography and X-ray diffraction**
Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

**UNIT  III Dielectric and Magnetic Materials**
Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

**UNIT IV   Quantum Mechanics and Free electron Theory**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

**UNIT V Semiconductors**

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation –  Hall effect and its applications.

**Textbooks:**
1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

**Reference Books:**
1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

**Web Resources:**https://www.loc.gov/rr/scitech/selected-internet/physics.html

**I Year B.Tech.  CSE (IOT) – I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# (23A54101) LINEAR ALGEBRA & CALCULUS
## (Common to All Branches of Engineering)

**Course Objectives:**

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

**Course Outcomes:** At the end of the course, the student will be able to

**CO1:** Develop and use of matrix algebra techniques that are needed by engineers for the practical applications.
**CO2:** Utilize mean value theorems to real life problems.
**CO3:** Familiarize with functions of several variables which is useful in optimization.
**CO4:** Learn important tools of calculus in higher dimensions.
**CO5:** Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

**UNIT I** **Matrices**
Rank of amatrixbyechel on form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

**UNIT II** **Eigen values, Eigenvectors and Orthogonal Transformation**
Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a  matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the  Quadratic Forms, Reduction of   Quadratic form to canonical forms by Orthogonal Transformation.

**UNIT III** **Calculus**
Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurintheorems with remainders (without proof), Problems and applications on the above theorems.

**UNIT IV** **Partial differentiation and Applications (Multi variable calculus)**
Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

**UNIT V** **Multiple Integrals (Multi variable Calculus)**
Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

**Textbooks:**
1. Higher Engineering Mathematics, B.S.Grewal,KhannaPublishers,2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley &Sons, 2018, 10th Edition.

**Reference Books:**
1. Thomas Calculus, George B.Thomas, MauriceD. WeirandJoelHass, Pearson Publishers,2018, 14th Edition.
2. Advanced Engineering Mathematics, R.K.JainandS.R.K.Iyengar,AlphaScienceInternationalLtd.,2021  5th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, GlynJames, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg,, Pearson publishers, 9[th]edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

**I Year B.Tech. CSE (IOT) – I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# (23A02101T) BASIC ELECTRICAL & ELECTRONICS ENGINEERING
## (Common to All branches of Engineering)

**Course Objectives**

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

**Course Outcomes:** After the completion of the course students will be able to

**Course Outcomes:**
**CO1:** Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
**CO2:** Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
**CO3:** Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
**CO4:** Analyze different electrical circuits, performance of machines and measuring instruments.
**CO5:** Evaluate different circuit configurations, Machine performance and Power systems operation.

## PART A: BASIC ELECTRICAL ENGINEERING

**UNIT  I**        **DC & AC Circuits**

**DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

**AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

**UNIT  II**        **Machines and Measuring Instruments**

**Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

**Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

**UNIT  III**        **Energy Resources, Electricity Bill & Safety Measures**

**Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

**Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

**Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

**Textbooks:**
1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

**Reference Books:**
1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath,  Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehta, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

**Web Resources:**
1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

## PART B: BASIC ELECTRONICS ENGINEERING

**Course Objectives:**
This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

**Course Outcomes:**
CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.
CO2: Explain the characteristics of diodes and transistors.
CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.
C04: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems.

**UNIT  I        SEMICONDUCTOR DEVICES**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

**UNIT II        BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION**

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common

emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

## UNIT III       DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

**Textbooks:**
1. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, $4^{th}$ Edition, Tata Mc Graw Hill, 2009

**Reference Books:**
1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

**I Year B.Tech. CSE (IOT)– I Semester**

| L | T | P | C |
|---|---|---|---|
| 1 | 0 | 4 | 3 |

# (23A03101T) ENGINEERING GRAPHICS
## (Common to All branches of Engineering)

**Course Objectives:**

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

**Course Outcomes:**

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3: Understand and draw projection of solids in various positions in first quadrant.
CO4: Explain principles behind development of surfaces.
CO5: Prepare isometric and perspective sections of simple solids.

**UNIT I**

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

**Scales:** Plain scales, diagonal scales and vernier scales.

**UNIT II**

**Orthographic Projections**: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

**UNIT III**

**Projections of Solids:** Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to anotherplane.

## UNIT IV

**Sections of Solids:** Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

**Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

## UNIT V

**Conversion of Views**: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Computer graphics**: Creating 2D&3D drawings ofobjects including PCB and Transformations using Auto CAD (*Not for end examination*).

**Textbook:**

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

**Reference Books:**

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

**I Year B.Tech. CSE (IOT)– I Semester**

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# (23A05101T) INTRODUCTION TO PROGRAMMING
**(Common to All branches of Engineering)**

**Course Objectives:**
- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

**Course Outcomes:** A student after completion of the course will be able to
CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyse a problem and develop an algorithm to solve it.
CO3: Implement various algorithms using the C programming language.
CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code.

**UNIT  I        Introduction to Programming and Problem Solving**
History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

**UNIT  II       Control Structures**
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

**UNIT  III      Arrays and Strings**
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

**UNIT  IV       Pointers & User Defined Data types**
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

**UNIT V        Functions & File Handling**
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

**Note:** The syllabus is designed with C Language as the fundamental language of implementation**.**

**Textbooks:**

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

**Reference Books:**
1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A ProblemSolving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

**I Year B.Tech. CSE (IOT)– I Semester**

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## (2305102) IT WORKSHOP
### (Common to all branches of Engineering)

**Course Objectives:**
- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

**Course Outcomes:**
CO1: Perform Hardware troubleshooting.
CO2: Understand Hardware components and inter dependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

**PC Hardware** & Software Installation
**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3**: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

**Internet & World Wide Web**
**Task1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there isno internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3**: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

## LaTeX and WORD
**Task 1 –** Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2:** Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

**Task 3:** Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

## EXCEL
**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.
**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

## LOOKUP/VLOOKUP
**Task 3**: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

## POWER POINT
**Task 1:** Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

## AI TOOLS – ChatGPT

**Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

**Reference Books**:
1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, $2^{nd}$ edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, $3^{rd}$ edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, $3^{rd}$ edition

**I Year B.Tech. CSE (IOT)– I Semester**

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## (23A56101P) ENGINEERING PHYSICS LAB
### (Common to All Branches of Engineering)

**Course Objectives:**

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

**Course Outcomes:** The students will be able to
CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wavelengths of different colours using diffraction grating.
CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5: Calculate the band gap of a given semiconductor.
CO6: Identify the type of semiconductor using Hall effect.

**List of Experiments:**
1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

**Note:** Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

**References:**
- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

**Web Resources**
- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

**I Year B.Tech. CSE (IOT)– I Semester**

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### (23A02101P) ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
### (Common to All branches of Engineering)

**Course Objectives:**

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

**Course Outcomes:**

**CO1:** Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

**CO2:** Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

**CO3:** Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

**CO4:** Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

**CO5:** Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

**Activities:**

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

### PART A: ELECTRICAL ENGINEERING LAB

**List of experiments:**

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger

7. Calculation of Electrical Energy for Domestic Premises

**Reference Books:**
1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

**Note:** Minimum Six Experiments to be performed.


# PART B: ELECTRONICS ENGINEERING LAB

**Course Objectives:**
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices& its applications.

**Course Outcomes:** At the end of the course, the student will be able to
CO1: Identify & testing of various electronic components.
CO2: Understand the usage of electronic measuring instruments.
CO3: Plot and discuss the characteristics of various electron devices.
CO4: Explain the operation of a digital circuit.

**List of Experiments:**

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.


Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.


**References:**

1. R. L. Boylestad& Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.


Note: Minimum Six Experiments to be performed.All the experiments shall be implemented using both Hardware and Software.

**I Year B.Tech. CSE (IOT)– I Semester**

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# (23A05101P) COMPUTER PROGRAMMING LAB
## (Common to All branches of Engineering)

**Course Objectives:**

The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

**Course Outcomes:**
CO1: Read, understand, and trace the execution of programs written in C language.
CO2: Select the right control structure for solving the problem.
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

## UNIT I

**WEEK 1**
**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

**Suggested Experiments/Activities:**
**Tutorial 1:** Problem-solving using Computers.
**Lab1:** Familiarization with programming environment
  i)   Basic Linux environment and its editors like Vi, Vim & Emacs etc.
  ii)  Exposure to Turbo C, gcc
  iii) Writing simple programs using printf(), scanf()

**WEEK 2**
**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

**Suggested Experiments /Activities:**
**Tutorial 2:** Problem-solving using Algorithms and Flow charts.
**Lab 1:** Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
  i)   Sum and average of 3 numbers
  ii)  Conversion of Fahrenheit to Celsius and vice versa
  iii) Simple interest calculation

**WEEK 3**
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

**Suggested Experiments/Activities:**
**Tutorial 3:** Variable types and type conversions:

**Lab 3:** Simple computational problems using arithmetic expressions.
   i)   Finding the square root of a given number
   ii)  Finding compound interest
   iii) Area of a triangle using heron's formulae
   iv)  Distance travelled by an object

**UNIT  II**

**WEEK 4**
**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

**Suggested Experiments/Activities:**

**Tutorial4:** Operators and the precedence and as associativity:
**Lab4:** Simple computational problems using the operator' precedence and associativity
   i)   Evaluate the following expressions.
          a.   A+B*C+(D*E) + F*G
          b.   A/B*C-B+A*D/3
          c.   A+++B---A
          d.   J= (i++) + (++i)
   ii)  Find the maximum of three numbers using conditional operator
   iii) Take marks of 5 subjects in integers, and find the total, average in float

**WEEK 5**
**Objective:** Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

**Suggested Experiments/Activities:**
**Tutorial 5:** Branching and logical expressions:
**Lab 5**: Problems involving if-then-else structures.
   i)   Write a C program to find the max and min of four numbers using if-else.
   ii)  Write a C program to generate electricity bill.
   iii) Find the roots of the quadratic equation.
   iv)  Write a C program to simulate a calculator using switch case.
   v)   Write a C program to find the given year is a leap year or not.

**WEEK 6**
**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

**Suggested Experiments/Activities:**
**Tutorial 6:** Loops, while and for loops
**Lab 6:** Iterative problems e.g., the sum of series
   i)   Find the factorial of given number using any loop.

ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

## UNIT III

### WEEK 7:
**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

**Suggested Experiments/Activities:**
**Tutorial 7:** 1 D Arrays: searching.
**Lab 7:**1D Array manipulation, linear search
   i) Find the min and max of a 1-D integer array.
   ii) Perform linear search on1D array.
   iii) The reverse of a 1D integer array
   iv) Find 2's complement of the given binary number.
   v) Eliminate duplicate elements in an array.

### WEEK 8:
**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

**Suggested Experiments/Activities:**
**Tutorial 8:** 2 D arrays, sorting and Strings.
**Lab 8:** Matrix problems, String operations, Bubble sort
   i) Addition of two matrices
   ii) Multiplication two matrices
   iii) Sort array elements using bubble sort
   iv) Concatenate two strings without built-in functions
   v) Reverse a string using built-in and without built-in string functions

## UNIT IV

### WEEK9:
**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation &amp; value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

**Suggested Experiments/Activities:**
**Tutorial 9:** Pointers, structures and dynamic memory allocation
**Lab 9:** Pointers and structures, memory dereference.
   i) Write a C program to find the sum of a 1D array using malloc()
   ii) Write a C program to find the total, average of n students using structures
   iii) Enter n students data using calloc() and display failed students list
   iv) Read student name and marks from the command line and display the student details along with the total.
   v) Write a C program to implement realloc()

### WEEK 10:

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

**Suggested Experiments/Activities:**
**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists
**Lab10 :** Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
   i)   Create and display a singly linked list using self-referential structure.
   ii)  Demonstrate the differences between structures and unions using a C program.
   iii) Write a C program to shift/rotate using bitfields.
   iv)  Write a C program to copy one structure variable to another structure of the same type.

## UNIT  V

**WEEK 11:**
**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

**Suggested Experiments/Activities:**
**Tutorial 11:** Functions, call by value, scope and extent,
**Lab 11:** Simple functions using call by value, solving differential equations using Eulers theorem.
   i)   Write a C function to calculate NCR value.
   ii)  Write a C function to find the length of a string.
   iii) Write a C function to transpose of a matrix.
   iv)  Write a C function to demonstrate numerical integration of differential equations using Euler's method

**WEEK 12:**
**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**
**Tutorial 12:** Recursion, the structure of recursive calls
**Lab 12:** Recursive functions
   i)   Write a recursive function to generate Fibonacci series.
   ii)  Write a recursive function to find the lcm of two numbers.
   iii) Write a recursive function to find the factorial of a number.
   iv)  Write a C Program to implement Ackermann function using recursion.
   v)   Write a recursive function to find the sum of series.

**WEEK 13:**
**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**
**Tutorial 13:** Call by reference, dangling pointers
**Lab 13:** Simple functions using Call by reference, Dangling pointers.
   i)   Write a C program to swap two numbers using call by reference.
   ii)  Demonstrate Dangling pointer problem using a C program.
   iii) Write a C program to copy one string into another using pointer.
   iv)  Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

**WEEK14:**
**Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

**Suggested Experiments/Activities:**
**Tutorial 14:** File handling
**Lab 14:** File operations
    i)   Write a C program to write and read text into a file.
    ii)  Write a C program to write and read text into a binary file using fread() and fwrite()
    iii) Copy the contents of one file to another file.
    iv) Write a C program to merge two files into the third file using command-line arguments.
    v)  Find no. of lines, words and characters in a file
    vi) Write a C program to print last n characters of a given file.

**Textbooks:**
1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum&#39; s Outline of Programming with C,  McGraw Hill

**Reference Books:**
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

**I Year B.Tech. CSE (IOT)– I Semester**

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# (23A99101) NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
## (Common to All branches of Engineering)

**Course Objectives:**
The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

**Course Outcomes:**   After completion of the course the students will be able to
    **CO1:** Understand the importance of discipline, character and service motto.
    **CO2:** Solve some societal issues by applying acquired knowledge, facts, and techniques.
    **CO3:** Explore human relationships by analyzing social problems.
    **CO4:** Determine to extend their help for the fellow beings and downtrodden people.
    **CO5:** Develop leadership skills and civic responsibilities.

**UNIT  I        Orientation**
General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

**Activities:**
i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

**UNIT  II       Nature & Care**
**Activities:**
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

**UNIT  III      Community Service**
**Activities:**

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v)  Any other programmes in collaboration with local charities, NGOs etc.

**Reference Books:**

1.  Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme*Vol;.I, Vidya Kutir Publication, 2021 ( ISBN 978-81-952368-8-6)
2.  *Red Book - National Cadet Corps –* Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3.  Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4.  Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5.  Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

**General Guidelines:**

1.  Institutes must assign slots in the Timetable for the activities.
2.  Institutes are required to provide instructor to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

**I Year B.Tech. CSE (IOT)– II Semester**

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### (23A52201T) COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

**Course Objectives:**
The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

**Course Outcomes:**
**CO1**: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
**CO2:** Applygrammaticalstructurestoformulatesentencesandcorrectwordforms.
**CO3:** Analyzediscoursemarkerstospeakclearlyonaspecifictopicininformaldiscussions.
**CO4:** Evaluate reading / listening text sand to write summaries based on global – Comprehension of these texts.
**CO5:** Create a coherent paragraph, essay, and resume.

**UNIT I**
**Lesson: HUMAN VALUES:** Gift of Magi **(Short Story)**

**Listening:**    Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
**Speaking:**    Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.
**Writing:**    Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
**Grammar:**    Parts of Speech, Basic Sentence Structures-forming questions
**Vocabulary:**  Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

**UNIT II**
**Lesson: NATURE:    The Brook by Alfred Tennyson (Poem)**

**Listening:**    Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
**Speaking:**    Discussion in pairs /small groups on specific topics followed by short structure talks.
**Reading:**    Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
**Writing:** Structure of a paragraph - Paragraph writing (specific topics)
**Grammar:**    Cohesive devices -linkers, use of articles and zero article; prepositions.
**Vocabulary:**  Homonyms, Homophones, Homographs.

**UNIT III**
**Lesson: BIOGRAPHY:  Elon Musk**

**Listening:**    Listening for global comprehension and summarizing what is listened to.
**Speaking:**    Discussing specific topics in pairs or small groups and reporting what is discussed

**Reading:** Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
**Writing:** Summarizing, Note-making, paraphrasing
**Grammar:** Verbs - tenses; subject-verb agreement; Compound words, Collocations
**Vocabulary:** Compound words, Collocations


**UNIT IV**
**Lesson: INSPIRATION: The Toys of Peace by** Saki

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
**Reading:** Studying the use of graphic elements in text stocon vey information, reveal trends /patterns/ relationships, communicate processes or display complicated data.
**Writing:** Letter Writing: Official Letters, Resumes
**Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice
**Vocabulary:** Words often confused, Jargons

**UNIT V**
**Lesson: MOTIVATION:** The Power of Intrapersonal Communication (An Essay)

**Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
**Speaking:** Formal oral presentations on topics from academic contexts
**Reading:** Reading comprehension.
**Writing:** Writing structured essays on specific topics.
**Grammar:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
**Vocabulary:** Technical Jargons

**Textbooks:**
1. Pathfinder: Communicative English for Undergraduate Students, 1$^{st}$ Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

**Reference Books:**
1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.


**Web Resources**:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/

5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

**VOCABULARY**

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

**I Year B.Tech. CSE (IOT) – II Semester**

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## (23A51202T) CHEMISTRY
(Common to EEE, ECE, CSE, IT) & allied branches)

C**ourse Objectives:**
- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electro chemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

**Course Outcomes:** At the end of the course, the students will be able to:
**CO1:** Compare the materials of construction for battery and electro chemical sensors.
**CO2**: Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
**CO3**: Explain the principles of spectrometry, slcinseparation of solid and liquid mixtures.
**CO4:** ApplytheprincipleofBanddiagramsintheapplicationofconductorsandsemiconductors.
**CO5:** Summarize the concepts of Instrumental methods.

## UNIT I       Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of $\Psi$ and $\Psi^2$, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. $\pi$-molecular orbital's of butadiene and benzene, calculation of bond order.

## UNIT II       Modern Engineering materials

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction basic concept, applications.

Super capacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

## UNIT III       Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conduct metric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

## UNIT IV       Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

**UNIT  V     Instrumental Methods and Applications**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

**Textbooks:**
1. Jain and Jain, Engineering Chemistry, 16/e,DhanpatRai,2013.
2. Peter Atkins, Juliode Paula and JamesKeeler, Atkins' Physical Chemistry,10/e, Oxford University Press, 2010.

**Reference Books:**
1. Skoog and West, Principles of Instrumental Analysis,6/e,Thomson,2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

**I Year B.Tech. CSE (IOT)– II Semester**

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# (23A54201) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
## (Common to All Branches of Engineering)

**Course Objectives:**

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

**Course Outcomes:** At the end of the course, the student will be able to

CO1: Solve the differential equations related to various engineering fields.
CO2: Identify solution methods for partial differential equations that model physical    processes.
CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO4: Estimate the work done against a field, circulation and flux using vector calculus.

### UNIT I                Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form.  Applications:  Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

### UNIT II        Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

### UNIT III            Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

### UNIT IV                Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

### UNIT V        Vector integration

LWithoutegral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

**Textbooks:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

**Reference Books:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

**I Year B.Tech. CSE (IOT)– II Semester**

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# (23A01201T) BASIC CIVIL AND MECHANICAL ENGINEERING
## (Common to All branches of Engineering)

**Course Objectives:**
- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

**Course Outcomes:** On completion of the course, the student should be able to:

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.

CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.

CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

## UNIT I
**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

## UNIT II
**Surveying:** Objectives of Surveying- Horizontal Measurements-  Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

## UNIT III
**Transportation Engineering** Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering**: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

**Textbooks:**
1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.

2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

**Reference Books:**
1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.


## PART B: BASIC MECHANICAL ENGINEERING

**Course Objectives:** The students after completing the course are expected to
- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

**Course Outcomes:** On completion of the course, the student should be able to
CO1: Understand the different manufacturing processes.
CO2: Explain the basics of thermal engineering and its applications.
CO3: Describe the working of different mechanical power transmission systems and power plants.
CO4: Describe the basics of robotics and its applications.

## UNIT I

**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
**Engineering Materials -** Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

## UNIT II

**Manufacturing Processes:** Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.
**Thermal Engineering** – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

## UNIT III

**Power plants** – working principle of Steam, Diesel, Hydro, Nuclear power plants.
**Mechanical Power Transmission -** Belt Drives, Chain, Ropedrives, Gear Drives and their applications.
**Introduction to Robotics -** Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

**Textbooks:**

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

**Reference Books:**

1. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

**I Year B.Tech. CSE (IOT)– II Semester**

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# (23A05201T) DATA STRUCTURES
(Common to CSE, IT & allied branches)

**Course Objectives:**
- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

**Course Outcomes:** At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.

CO5: Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**UNIT I**
**Introduction to Linear Data Structures:** Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

**UNIT II**
**Linked Lists:** Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

**UNIT III**
**Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

**UNIT IV**
**Queues:** Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.
**Deques:** Introduction to deques (double-ended queues), Operations on deques and their applications.

**UNIT V**
Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal
**Hashing: Brief** introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

**Textbooks:**
1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2$^{nd}$ Edition.

2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

**I Year B.Tech. CSE (IOT)– II Semester**

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## (23A52201P) COMMUNICATIVE ENGLISH LAB
(Common to All Branches of Engineering)

**Course Objectives:**

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

**Course Outcomes:**
CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2: Apply communication skills through various language learning activities.
CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable divisionfor better listening and speaking comprehension.
CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.
CO5: Create effective Course Objectives:

**List of Topics:**
1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

**Suggested Software:**
- Walden Infotech
- Young India Films

**Reference Books:**
1. Raman Meenakshi, Sangeeta- Sharma. *Technical Communication*. Oxford Press.2018.
2. TaylorGrant:*EnglishConversationPractice*,TataMcGraw-HillEducationIndia,2016
3. Hewing's, Martin. Cambridge *Academic English*(B2).CUP,2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2^ndEd),Kindle, 2013

**Web Resources:**

**Spoken English:**

1. www.esl-lab.com

2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

**Voice & Accent:**
1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

**I Year B.Tech. CSE (IOT)– II Semester**

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## (23A51202P) CHEMISTRY LAB
(Common to EEE, ECE, CSE, IT & allied branches)

**Course Objectives**:
- Verify the fundamental concepts with experiments.

**Course Outcomes:** At the end of the course, the students will be able to

CO1: Determine the cell constant and conduct a nceofsolutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyse the IR spectra of some organic compounds.
CO5: Calculate strength of acid in Pb-Acid battery.

**List of Experiments:**

1. Measurement of 10Dq by spectro photo metric method

2. Conduct metric titration of strong acid vs. strong base

3. Conduct metric titration of weak acid vs. strong base

4. Determination of cell constant and conductance of solutions

5. Potentiometer - determination of redox potentials and emfs

6. Determination of Strength of an acid in Pb-Acid battery

7. Preparation of a Bakelite

8. Verify Lambert-Beer's law

9. Wavelength measurement of sample through UV-Visible Spectroscopy

10. Identification of simple organic compounds by IR

11. Preparation of nanomaterials by precipitation method

12. Estimation of Ferrous Iron by Dichrometry

**Reference:**

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

**I Year B.Tech. CSE (IOT)– II Semester**

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## (23A03201) ENGINEERING WORKSHOP
**(Common to All branches of Engineering)**

**Course Objectives:**

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

**Course Outcomes:**

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

**SYLLABUS**

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a) Half – Lap joint   b) Mortise and Ten on joint   c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray      b) Conical funnel      c) Elbow pipe      d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit      b) Dovetail fit      c) Semi-circular fit    d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series      b) Two-way switch      c) God own lighting
   d) Tube light      e) Three phase motor      f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

**Reference Books:**

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

**I Year B.Tech. CSE (IOT)– II Semester**

| L | T | P | C |
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## (23A05201P) DATA STRUCTURES LAB
### (Common to CSE, IT & allied branches)

**Course Objectives:**

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

**Course Outcomes:** At the end of the course, Student will be able to

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.
CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**List of Experiments:**

**Exercise 1: Array Manipulation**
   i)   Write a program to reverse an array.
   ii)  C Programs to implement the Searching Techniques – Linear & Binary Search
   iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

**Exercise 2: Linked List Implementation**
   i)   Implement a singly linked list and perform insertion and deletion operations.
   ii)  Develop a program to reverse a linked list iteratively and recursively.
   iii) Solve problems involving linked list traversal and manipulation.

**Exercise 3: Linked List Applications**
   i)   Create a program to detect and remove duplicates from a linked list.
   ii)  Implement a linked list to represent polynomials and perform addition.
   iii) Implement a double-ended queue (deque) with essential operations.

**Exercise 4: Double Linked List Implementation**
   i)   Implement a doubly linked list and perform various operations to understand its properties and applications.
   ii)  Implement a circular linked list and perform insertion, deletion, and traversal.

**Exercise 5: Stack Operations**
   i)   Implement a stack using arrays and linked lists.
   ii)  Write a program to evaluate a postfix expression using a stack.
   iii) Implement a program to check for balanced parentheses using a stack.

**Exercise 6: Queue Operations**
   i)   Implement a queue using arrays and linked lists.
   ii)  Develop a program to simulate a simple printer queue system.
   iii) Solve problems involving circular queues.

**Exercise 7: Stack and Queue Applications**
   i)   Use a stack to evaluate an infix expression and convert it to postfix.
   ii)  Create a program to determine whether a given string is a palindrome or not.
   iii) Implement a stack or queue to perform comparison and check for symmetry.

**Exercise8: Binary Search Tree**
   i)   Implementing a BST using Linked List.
   ii)  Traversing of BST.

**Exercise 9: Hashing**
   i)   Implement a hash table with collision resolution techniques.
   ii)  Write a program to implement a simple cache using hashing.

**Textbooks:**
   1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
   2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**Reference Books:**
   1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
   2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
   3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
   4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
   5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick.

**I Year B.Tech. CSE (IOT)– II Semester**

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# (23A99201) HEALTH AND WELLNESS, YOGA AND SPORTS
**(Common to All branches of Engineering)**

**Course Objectives:**

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

**Course Outcomes:** After completion of the course the student will be able to
    **CO1**: Understand the importance of yoga and sports for Physical fitness and sound health.
    **CO2:** Demonstrate an understanding of health-related fitness components.
    **CO3:** Compare and contrast various activities that help enhance their health.
    **CO4:** Assess current personal fitness levels.
    **CO5:** Develop Positive Personality

## UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

**Activities:**

    i)  Organizing health awareness programmes in community
    ii)  Preparation of health profile
    iii) Preparation of chart for balance diet for all age groups

## UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

**Activities:**

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

## UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

**Activities:**

    i)  Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
    ii)  Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

**Reference Books:**
1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty,  SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

**General Guidelines:**

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.

A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A54301) DISCRETE MATHEMATICS & GRAPH THEORY
### (Common to CSE and all CSE allied branches)

**Course Outcomes:** After successful completion of this course, the students should be able to:

| COs | Statements | Blooms level |
|---|---|---|
| CO1 | Apply mathematical logic to solve problems. | L2, L3 |
| CO2 | Understand the concepts and perform the operations related to sets, relations and functions. | L3, L5 |
| CO3 | Apply basic counting techniques to solve combinatorial problems. | L3 |
| CO4 | Formulate problems and solve recurrence relations. | L2, L3 |
| CO5 | Apply Graph Theory in solving computer science problems | L3, L5 |

**UNIT I      Mathematical Logic**
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

**UNIT II      Set theory**
The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

**UNIT III      Elementary Combinatorics**
Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

**UNITIV:      Recurrence Relations**
Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

**UNITV      Graphs**
Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs.

**Textbooks:**
1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

**Reference Books:**
1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science.

Online Learning Resources:
1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

**II Year B.Tech. CSE (IOT) – I Semester**

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**(23A52301) UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT**
**(Common to All Branches of Engineering)**

**Course Objectives:**
- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

| COURSE OUTCOMES: At the end of the course, students will be able to | Blooms Level |
|---|---|
| CO1 | Define the terms like Natural Acceptance, Happiness and Prosperity | L1, L2 |
| CO2 | Identify oneself, and one's surroundings (family, society nature) | L1, L2 |
| CO3 | Apply what they have learnt to their own self in different day-to-day settings in real life | L3 |
| CO4 | Relate human values with human relationship and human society. | L4 |
| CO5 | Justify the need for universal human values and harmonious existence | L5 |
| CO6 | Develop as socially and ecologically responsible engineers | L3, L6 |

**Course Topics**

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I       Introduction to Value Education (6 lectures and 3 tutorials for practice session)
             Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
             Lecture 2: Understanding Value Education
             Tutorial 1: Practice Session PS1 Sharing about Oneself
             Lecture 3: self-exploration as the Process for Value Education
             Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
             Tutorial 2: Practice Session PS2 Exploring Human Consciousness
             Lecture 5: Happiness and Prosperity – Current Scenario
             Lecture 6: Method to Fulfill the Basic Human Aspirations
             Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II      Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
             Lecture 7: Understanding Human being as the Co-existence of the self and the body.
             Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III      Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV      Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

UNIT V      Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

**READINGS:**
**Textbook and Teachers Manual**
a. The Textbook
R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual
R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

**Reference Books**
1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

**Mode of Conduct:**
Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

## Online Resources

**1.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf

**2.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf

**3.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

**4.** https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf

**5.** https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

**6.** https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

**7.** https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%202023-25%20Ethics%20v1.pdf

**8.** https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385

https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A30402) DIGITAL LOGIC & COMPUTER ORGANIZATION

**Course Objectives:** The main objective of the course is to
- Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices

**Course Outcomes:** After completion of the course, students will be able to
- Differentiate between combinational and sequential circuits based on their characteristics and functionalities. (L2)
- Demonstrate an understanding of computer functional units. (L2)
- Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.(L3)
- Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability. (L3)
- Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques. (L3)
- Design Sequential and Combinational Circuits (L6)

**UNIT – I**
**Data Representation:** Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes
**Digital Logic Circuits-I:** Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

**UNIT – II**
**Digital Logic Circuits-II**: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters
**Basic Structure of Computers:** Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

**UNIT – III**
**Computer Arithmetic**: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations
**Processor Organization:** Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

**UNIT – IV**
**The Memory Organization:** Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

**UNIT – V**

**Input/Output Organization:** Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

**Textbooks:**
1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 6$^{th}$ edition, McGraw Hill, 2023.
2. Digital Design, 6$^{th}$ Edition, M. Morris Mano, Pearson Education, 2018.
3. Computer Organization and Architecture, William Stallings, 11$^{th}$Edition, Pearson, 2022.

**Reference Books:**
1. Computer Systems Architecture, M.Moris Mano, 3$^{rd}$Edition, Pearson, 2017.
2. Computer Organization and Design, David A. Paterson, John L. Hennessy, Elsevier, 2004.
3. Fundamentals of Logic Design, Roth, 5$^{th}$Edition, Thomson, 2003.

**Online Learning Resources:**
https://nptel.ac.in/courses/106/103/106103068/

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A05302T) ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS

**Course Objectives:** The main objective of the course is to
- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

**Course Outcomes:** After completion of the course, students will be able to
- Illustrate the working of the advanced tree data structures and their applications (L2)
- Understand the Graph data structure, traversals and apply them in various contexts. (L2)
- Use various data structures in the design of algorithms (L3)
- Recommend appropriate data structures based on the problem being solved (L5)
- Analyze algorithms with respect to space and time complexities (L4)
- Design new algorithms (L6)

### UNIT – I
Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.
AVL Trees – Creation, Insertion, Deletion operations and Applications
B-Trees – Creation, Insertion, Deletion operations and Applications

### UNIT – II
Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications
Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

### UNIT – III
Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths
Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

### UNIT – IV
Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem
Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

### UNIT – V
NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem
NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)
NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

**Textbooks:**

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran2nd Edition University Press

**Reference Books:**

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein&Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures &Programs:,N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni& Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

**Online Learning Resources:**

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari,1. Introduction to Algorithms (youtube.com)

**II Year B.Tech. CSE (IOT) – I Semester**

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## (23A05303T) OBJECT-ORIENTED PROGRAMMING THROUGH JAVA

**Course Objectives:** The learning objectives of this course are to:
- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apisfor program development

**Course Outcomes:** After completion of the course, students will be able to
- Analyze problems, design solutions using OOP principles, and implement them efficiently in Java. (L4)
- Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects (L4)
- Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch. (L3)
- Apply Competence in handling exceptions and errors to write robust and fault-tolerant code. (L3)
- Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX. (L3)
- Choose appropriate data structure of Java to solve a problem (L6)

**UNIT I: Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.
**Data Types**, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.
**Control Statements**: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.


**UNIT II: Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.
**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

**UNIT III: Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in

Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.


**UNIT IV: Packages and Java Library:** Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)


**UNIT V: String Handling in Java:**Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings,Comparison, Modifying, Searching; Class String Buffer.

**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

**Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

**Textbooks:**
1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object-Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4<sup>th</sup> Edition, Pearson.

**References Books:**
1. The complete Reference Java, 11<sup>th</sup>edition, Herbert Schildt,TMH
2. Introduction to Java programming, 7<sup>th</sup> Edition, Y Daniel Liang, Pearson

**Online Resources:**
1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881 6347_shared/overview

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A05302P) ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

**Course Objectives:** The objective of the course is to
- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

**Course Outcomes:** After completion of the course, students will be able to
- Design and develop programs to solve real world problems with the popular algorithm design methods. (L5)
- Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs. (L2)
- Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (L5)
- Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. (L3)
- Compare the performance of different of algorithm design strategies (L4)
- Design algorithms to new real world problems (L6)

**Experiments covering the Topics:**
- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Minimum cost spanning trees
- Shortest path algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

**Sample Programs:**
1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix          b) Adjacency Lists
5. Write a program for finding the bi-connected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

**Reference Books:**
1. Fundamentals of Data Structures in C++, Horowitz Ellis, SahniSartaj, Mehta, Dinesh, 2$^{nd}$Edition, Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2$^{nd}$Edition, University Press
3. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
4. An introduction to Data Structures with applications, Trembley& Sorenson, McGraw Hill

**Online Learning Resources:**
1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A05303P) OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB

**Course Objectives:** The aim of this course is to
- Practice object-oriented programming in the Java programming language
- implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

**Course Outcomes:** After completion of the course, students will be able to
- Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling. (L2)
- Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively. (L3)
- Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. (L2)
- Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. (L3)
- Proficiently construct graphical user interface (GUI) applications using JavaFX (L4)
- Develop new programs for solving typical computer science problems (L6)

**Experiments covering the Topics:**
- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

**Sample Experiments:**
**Exercise – 1**:
a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

**Exercise - 2**
a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program using StringBuffer to delete, remove character.

**Exercise - 3**
a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program implement method overloading.
c) Write a JAVA program to implement constructor.
d) Write a JAVA program to implement constructor overloading.

**Exercise - 4**
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance
c) Write a JAVA program for abstract class to find areas of different shapes

**Exercise - 5**
a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
c) Write a JAVA program that implements Runtime polymorphism

**Exercise - 6**
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses
● Write a JAVA program for creation of Java Built-in Exceptions
● Write a JAVA program for creation of User Defined Exception

**Exercise - 7**
a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
b) Write a program illustrating **is Alive** and **join ()**
c) Write a Program illustrating Daemon Threads.
d) Write a JAVA program Producer Consumer Problem

**Exercise – 8**
1. Write a JAVA program that import and use the user defined packages
2. Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
3. Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

**Exercise – 9**
4.     Write a java program that connects to a database using JDBC
**b)**Write a java program to connect to a database using JDBC and insert  values into it.
c) Write a java program to connect to a database using JDBC and delete  values from it

**Textbooks:**
   1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
   2. Joy with JAVA, Fundamentals of Object-Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
   3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

**References Books:**
   1. The complete Reference Java, 11th edition, Herbert Schildt,TMH
   2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

**Online Resources:**
   1. https://nptel.ac.in/courses/106/105/106105191/
   2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A05304) PYTHON PROGRAMMING
### (SKILL ENHANCEMENT COURSE)

**Course Objectives:** The main objectives of the course are to
- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

**Course Outcomes:** After completion of the course, students will be able to
- Classify data structures of Python (L4)
- Apply Python programming concepts to solve a variety of computational problems (L3)
- Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
- Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
- Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)
- Propose new solutions to computational problems (L6)

**UNTI-I:** History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.
**Parts of Python Programming Language:** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.
**Control Flow Statements:** if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

**Sample Experiments:**
1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

**UNIT-II: Functions:** Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
**Strings:** Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
**Lists**: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

**Sample Experiments:**
1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i. Addition          ii. Insertion          iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

**UNIT-III: Dictionaries:** Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.
**Tuples and Sets:** Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.
**Sample Experiments:**
1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

**UNIT-IV:Files**: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.
**Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.
**Sample Experiments:**
1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

**UNIT-V: Introduction to Data Science:** Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.
**Sample Experiments:**
1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
   a)     Apply head () function to the pandas data frame
   b)     Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

**Reference Books:**
1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2$^{nd}$Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

**Online Learning Resources/Virtual Labs:**
1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A99301) ENVIRONMENTAL SCIENCE

**Course Objectives:**
- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

**UNIT I**
**Multidisciplinary Nature of Environmental Studies: –** Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT II**
**Ecosystems:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
      a.    Forest ecosystem.
      b.    Grassland ecosystem
      c.    Desert ecosystem.
      d.    Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity and its Conservation :** Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT III**
**Environmental Pollution:** Definition, Cause, effects and control measures of :
      a.      Air Pollution.
      b.      Water pollution
      c.      Soil pollution
      d.      Marine pollution
      e.      Noise pollution
      f.      Thermal pollution
      g.      Nuclear hazards

**Solid Waste Management:** Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

**UNIT IV**
**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and

possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

**UNIT V**
**Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.
**Field Work:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**Textbooks**:
1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

**References:**
1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

**II Year B.Tech. CSE (IOT) – I Semester**

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### (23A52402a) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**Course Objectives:**
- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

**Course Outcomes:**
- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the     fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision (L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of business entity (L5)

**UNIT - I      Managerial Economics**
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

**UNIT - II      Production and Cost Analysis**
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

**UNIT - III      Business Organizations and Markets**
Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

**UNIT - IV      Capital Budgeting**
Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

**UNIT - V      Financial Accounting and Analysis**
Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with

simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

**Textbooks:**
1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

**Reference Books:**
1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

**Online Learning Resources:**
https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

**II Year B.Tech. CSE (IOT) – I Semester**

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## (23A52402b) ORGANISATIONAL BEHAVIOUR

**Course Objectives:**
- To enable student's comprehension of organizational behavior
- To offer knowledge to students on self-motivation, leadership and management
- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

**Course Outcomes:**
- Define the Organizational Behaviour, its nature and scope. (L2)
- Understand the nature and concept of Organizational behaviour (L2)
- Apply theories of motivation to analyse the performance problems (L3)
- Analyse the different theories of leadership (L4)
- Evaluate group dynamics (L5)
- Develop as powerful leader (L5)

**UNIT - I      Introduction to Organizational Behavior**
Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude -Perception - Learning – Personality.

**UNIT - II      Motivation and Leading**
Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

**UNIT - III      Organizational Culture**
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader.

**UNIT - IV      Group Dynamics**
Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution

**UNIT - V      Organizational Change and Development**
Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

**Textbooks:**
1. Luthans, Fred, OrganisationalBehaviour, McGraw-Hill, 12 Th edition.
2. P Subba Ran, OrganisationalBehaviour, Himalya Publishing House.

**Reference Books:**
1. McShane, Organizational Behaviour, TMH
2. Nelson, OrganisationalBehaviour, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, OrganisationalBehaviour, Pearson.
4. Aswathappa, OrganisationalBehaviour, Himalaya.

**Online Learning Resources:**

https://www.slideshare.net/Knight1040/organizational-culture
9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

**II Year B.Tech. CSE (IOT) – I Semester**

| L | T | P | C |
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## (23A52402c) BUSINESS ENVIRONMENT

**Course Objectives:**
- To make the student to understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

**Course Outcomes:**
- Define Business Environment and its Importance. (L2)
- Understand various types of business environment. (L2)
- Apply the knowledge of Money markets in future investment (L3)
- Analyse India's Trade Policy  (L4)
- Evaluate fiscal and monitory policy (L5)
- Develop a personal synthesis and approach for identifying business opportunities (L5)

**UNIT - I**          Overview of Business Environment
Introduction – meaning Nature, Scope, significance, functions and advantages. Types-Internal &External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis.

**UNIT - II**          Fiscal & Monetary Policy
Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget-Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.

**UNIT - III**          India's Trade Policy
Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

**UNIT - IV**          World Trade Organization
Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

**UNIT - V**          Money Markets and Capital Markets
Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

**Textbooks:**
1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH

**Reference Books:**
1. K. V. Sivayya, V. B. M Das, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N, International Business, Wiley India.
4. E. Bhattacharya, International Business, Excel Publications, New Delhi.

**Online Learning Resources:**
https://www.slideshare.net/ShompaDhali/business-environment-53111245
https://www.slideshare.net/rbalsells/fiscal-policy-ppt
https://www.slideshare.net/aguness/monetary-policy-presentationppt
https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982
https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
https://www.slideshare.net/viking2690/wto-ppt-60260883
https://www.slideshare.net/prateeknepal3/ppt-mo

**II Year B.Tech. CSE (IOT) – I Semester**

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## (23A54401) PROBABILITY & STATISTICS

## (Common to CSE, CSE (AI &ML), CSE(IoT), CSE(AI),AI&ML, CS, IT)

**Course Outcomes:** After successful completion of this course, the students should be able to:

| COs | Statements | Blooms level |
|-----|------------|--------------|
| CO1 | Acquire knowledge in finding the analysis of the data quantitatively or categoricallyand various statistical elementary tools. | L2, L3 |
| CO2 | Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems. | L3, L5 |
| CO3 | Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas. | L3 |
| CO4 | Analyze to test various hypotheses included in theory and types of errors for large samples. | L2, L3 |
| CO5 | Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems. | L3,L5 |

**UNITI :**      **Descriptive statistics**

Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.

**UNIT II**      **Probability**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

**UNIT III Probability distributions**

Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality). Approximation of the binomial distribution to normal distribution.

**UNIT IV**      **Estimation and Testing of hypothesis, large sample tests**

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

**UNIT V**      **Small sample tests**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi2$ - test for goodness of fit, $\chi2$ - test for independence of attributes.

**Textbooks:**
1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

**Reference Books:**
1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

Online Learning Resources:
1.  https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2.  https://onlinecourses.nptel.ac.in/noc22_mg31/preview

**II Year B.Tech. CSE (IOT) – II Semester**

| L | T | P | C |
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### (23A35401T) OPERATING SYSTEMS

**Course Objectives:** The main objectives of the course is to make student
- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

**Course Outcomes:** After completion of the course, students will be able to
- Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)
- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. (L3)
- Illustrate different conditions for deadlock and their possible solutions. (L2)
- Analyze the memory management and its allocation policies. (L4)

**UNIT - I**
**Operating Systems Overview:** Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems  **System Structures:** Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

**UNIT - II**
**Processes:** Process Concept, Process scheduling, Operations on processes, Inter-process communication. **Threads and Concurrency:** Multithreading models, Thread libraries, Threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

**UNIT – III**
**Synchronization Tools:** The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization. **Deadlocks:** system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

**UNIT - IV**
**Memory-Management Strategies:** Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. **Virtual Memory Management:** Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing. **Storage Management:** Overview of Mass Storage Structure, HDD Scheduling.

**UNIT - V**
**File System:** File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System

Mounting, Partitions and Mounting, File Sharing. **Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

**Textbooks:**
1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

**Reference Books:**
1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw-Hill, 2013

**Online Learning Resources:**
1. https://nptel.ac.in/courses/106/106/106106144/
2. https://peterindia.net/OperatingSystems.html

**II Year B.Tech. CSE (IOT) – II Semester**

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

### (23A04405T) MICROPROCESSORS & MICROCONTROLLERS

**Course objectives:** The main objectives of this course are
- To introduce fundamental architectural concepts of microprocessors and microcontrollers.
- To impart knowledge on addressing modes and instruction set of 8086 and 8051
- To introduce assembly language programming concepts
- To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors.
- To develop programs efficiently on ARM Cortex processors and debug.

**Course Outcomes:** At the end of this course the student will be able to
- Distinguish between microprocessors & microcontrollers (L2)
- Demonstrate programming skills in assembly language for processors and Controllers. (L3)
- Analyze various interfacing techniques (L4)
- Apply the techniques for the design of processor / Controller based systems. (L4)

**UNIT I**
Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures. 8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

**UNIT II**
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

**UNIT III**
8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

**UNIT-IV**
Intel 8051 MICROCONTROLLER
Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.
Assembly language programming: Instructions, addressing modes, simple programs.
Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

**UNIT–V**
ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and Interfaces Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.

ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

**Textbooks:**
1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition,1994.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You.

**Reference Books:**
1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media,2017.
2. Cortex -M3 Technical Reference Manual.

**II Year B.Tech. CSE (IOT) – II Semester**

| L | T | P | C |
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### (23A37401T) COMPUTER NETWORKS

**Course Objectives:** The main objectives of the course is to
- To understand the different types of networks
- To discuss the software and hardware components of a network
- To develop an understanding of the principles of computer networks.
- To familiarize with OSI model and the functions of layered structure.
- To explain networking protocols, algorithms and design perspectives

**Course Outcomes (CO):**
- CO1: Identify the software and hardware components of a Computer network (L3)
- CO2: Design software for a Computer network (L6)
- CO3: Develop new routing, and congestion control algorithms (L6)
- CO4: Analyze the functionality of each layer of a computer network (L4)
- CO5: Employ appropriate transport protocol based on the application requirements. (L5)

**UNIT I:**
**Introduction:** Types of Computer Networks, Broadband Access Networks, Mobile and Wireless Access Networks, Content Provider Networks, Transit networks, Enterprise Networks, Network technology from local to global, Personal Area Networks, Local Area Networks, Home Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network Protocols, Design Goals, Protocol Layering, Connections and Reliability, Service Primitives, The Relationship of Services to Protocols ,Reference Models, The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model and Protocols.

**UNIT II:**
**The Data Link Layer:** Guided Transmission Media, Persistent Storage, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Data Link Layer Design Issues, Services Provided To The Network Layer, Framing Error Control, Flow Control, Error Detection And Correction, Error-Correcting Codes, Error-Detecting Codes, Elementary Data Link Protocols, Initial Simplifying Assumptions Basic Transmission And Receipt, Simplex Link-Layer Protocols, Improving Efficiency, Bidirectional Transmission, Multiple Frames In Flight, Examples Of Full-Duplex, Sliding Window Protocols, The Channel Allocation Problem, Static Channel Allocation, Assumptions For Dynamic Channel Allocation, Multiple Access Protocols, Aloha, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wireless LAN Protocols, Ethernet, Classic Ethernet Physical Layer, Classic Ethernet Mac Sublayer Protocol, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet,40- And 100-Gigabit Ethernet, Retrospective On Ethernet.

**UNIT III:**
**The Network Layer:** Network Layer Design Issues, Store-And-Forward Packet Switching, Services Provided To The Transport Layer, Implementation Of Connectionless Service, Implementation Of Connection-Oriented Service, Comparison Of Virtual-Circuit And Datagram Networks, Routing Algorithms In A Single Network, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing Within a Network, Broadcast Routing, Multicast Routing, Anycast Routing, Traffic Management at The Network Layer, The Need for Traffic Management: Congestion, Approaches To Traffic

Management, Internetworking, Internetworks: An Overview, How Networks differ, Connecting Heterogeneous Networks, Connecting Endpoints Across Heterogeneous Networks, Internetwork Routing: Routing Across Multiple Networks Supporting Different Packet Sizes: Packet Fragmentation, The Network Layer In The Internet, The IP Version 4 Protocol, IP Addresses, IP Version 6, Internet Control Protocols, Label Switching and MPLS, OSPF—An Interior Gateway Routing Protocol, BGP—The Exterior Gateway Routing Protocol, Internet Multicasting.

**UNIT IV:**
**The Transport Layer:** The Transport Service, Services Provided To The Upper Layers, Transport Service Primitives, Berkeley Sockets, An Example Of Socket Programming: An Internet File Server, Elements Of Transport Protocols, Addressing, Connection Establishment, Connection Release, Error Control And Flow Control, Multiplexing, Crash Recovery, Congestion Control, Desirable Bandwidth Allocation, Regulating The Sending Rate, Wireless Issues, The Internet Transport Protocols: UDP, Introduction To UDP, Remote Procedure Call, Real-Time Transport Protocols, The Internet Transport Protocols: TCP, Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

**UNIT V:**
**The Application Layer:** Electronic Mail, Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web, Architectural Overview, Static Web Objects, Dynamic Web Pages and Web Applications, HTTP and HTTPS, Web Privacy, Content Delivery, Content and Internet Traffic, Server Farms and Web Proxies, Content Delivery Networks, Peer-To-Peer Networks, Evolution of The Internet.

**Textbooks:**
Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition.

**Reference Books:**
1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.
3. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

**Web-Resources:**
https://nptel.ac.in/courses/106105183/25
http://www.nptelvideos.in/2012/11/computer-networks.html
https://nptel.ac.in/courses/106105183/3

**II Year B.Tech. CSE (IOT) – II Semester**

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## (23a35403) COMPUTER NETWORKS AND OPERATING SYSTEMS LAB

**Course Objectives:**
- To understand the different types of networks
- To discuss the software and hardware components of a network
- To enlighten the working of networking commands supported by operating system
- To familiarize the use of networking functionality supported by JAVA
- To familiarize with computer networking tools.

**Course Outcomes:** After completion of the course, students will be able to
- Analyze the data traffic using network tools (L4)
- Understand network commands (L2)
- Trace different CPU Scheduling algorithms (L2).
- Implement Bankers Algorithms to Avoid Dead Locks (L3).
- Evaluate CPU scheduling and Page replacement algorithms (L5).

**List of Activities/Experiments (Computer Networks):**
1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables.
     - Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports.
     - Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.
2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup
3. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
4. Use Packet tracer software to build network topology and configure using Link State routing protocol.
5. Using JAVA RMI Write a program to implement Basic Calculator.
6. Implement a Chatting application using JAVA TCP and UDP sockets.
7. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbor. Implement Hello and Echo commands using JAVA.
8. Using Wireshark perform the following operations:
     - Inspect HTTP Traffic
     - Inspect HTTP Traffic from a Given IP Address,
     - Inspect HTTP Traffic to a Given IP Address,
     - Reject Packets to Given IP Address,
     - Monitor Apache and MySQL Network Traffic.

**Experiments covering the Topics:**
- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies

- Memory allocation strategies

**Sample Experiments:**
1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls
   fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
4. Write a program to solve producer-consumer problem using Semaphores.
5. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit
6. Simulate the following page replacement algorithms
   a) FIFO b) LRU c) LFU
7. Simulate Paging Technique of memory management.
8. Implement Bankers Algorithm for Dead Lock avoidance

**Textbooks:**
1. ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "TCP/IP Essentials:A Lab-Based Approach", Cambridge University Press, 2004.
2. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10<sup>th</sup> Edition, Wiley, 2018.

**Reference Books**
1. Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.
2. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.
3. Modern Operating Systems, Tanenbaum A S, 4<sup>th</sup> Edition, Pearson, 2016

**Online Learning Resources:**
https://www.netacad.com/courses/packet-tracer - Cisco Packet Tracer.
Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
https://www.wireshark.org/docs/wsug_html_chunked/ -Wireshark.
https://nptel.ac.in/courses/106105183/25
http://www.nptelvideos.in/2012/11/computer-networks.html
https://nptel.ac.in/courses/106105183/3
http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php
https://www.cse.iitb.ac.in/~mythili/os/
http://peterindia.net/OperatingSystems.html

**II Year B.Tech. CSE (IOT) – II Semester**

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## (23A04405P) MICROPROCESSORS & MICROCONTROLLERS LAB

**Course Objectives:**
To acquire the knowledge on microprocessors and microcontrollers, interfacing various peripherals, configure and develop programs to interface peripherals/sensors.

**Course Outcomes:**
- Formulate problems and implement algorithms using Assembly language.
- Develop programs for different applications.
- Interface peripheral devices with Processors and Controllers
- Use Assembly/Embedded C programming approach for solving real world problems

**List of Experiments:**
**PART- A:** (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programming and Interfacing
1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition of n-BCD numbers.
   b. Multiplication and Division operations.
2. Program for sorting anarray.
3. Program for Factorial of givenn-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

**PART-B:** (Minimum of 5 Experiments has to be performed)
8051 Assembly Language Programming and Interfacing
1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051 6. Interfacing LCD to8051

**PART-C** (Minimum of 2 Experiments has to be performed)
Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM
1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.

**Equipment Required:** 1. Regulated Power supplies 2. Analog/Digital Storage Oscilloscopes 3. 8086 Microprocessor kits 4. 8051 microcontroller kits 5. ADC module 6. DAC module 7. Stepper motor module8. Keyboard module9. LED, 7-Segemt Units10. Digital Multimeters
11. ROM/RAM Interface module12. Bread Board etc.13. ARM CORTEX M314. KEIL MDKARM

**II Year B.Tech. CSE (IOT) – II Semester**

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### (23A52401) FULL STACK DEVELOPMENT – 1
### (Skill Enhancement Course)

**Course Objectives:** The main objectives of the course are to
- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

**Course Outcomes:**
- CO1: Design Websites. (L6)
- CO2: Apply Styling to web pages. (L4)
- CO3: Make Web pages interactive. (L6)
- CO4: Design Forms for applications. (L6)
- CO5: Choose Control Structure based on the logic to be implemented. (L3)
- CO6: Understand HTML tags, Attributes and CSS properties (L2)

**Experiments covering the Topics:**
- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

**Sample Experiments:**
**1. Lists, Links and Images**
a. Write a HTML program, to explain the working of lists.
   Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.
c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

**2. HTML Tables, Forms and Frames**
- Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)
- Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
- Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio

buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
● Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame ☐ image, second frame ☐ paragraph, third frame ☐ hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

## 3. HTML 5 and Cascading Style Sheets, Types of CSS
a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, <span> tags.
b. Write a HTML program, to embed audio and video into HTML web page.
c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

## 4. Selector forms
a. Write a program to apply different types of selector forms
   ● Simple selector (element, id, class, group, universal)
   ● Combinator selector (descendant, child, adjacent sibling,  general sibling)
   ● Pseudo-class selector
   ● Pseudo-element selector
   ● Attribute selector

## 5. CSS with Color, Background, Font, Text and CSS Box Model
a. Write a program to demonstrate the various ways you can reference a color in CSS.
b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
c. Write a program using the following terms related to CSS font and text:
   i. font-size          ii. font-weight          iii. font-style
   iv. text-decoration    v. text-transformation      vi. text-alignment
d. Write a program, to explain the importance of CSS Box model using
   i.  Content       ii. Border       iii. Margin       iv. padding

## 6. Applying JavaScript - internal and external, I/O, Type Conversion
a. Write a program to embed internal and external JavaScript in a web page.
b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

## 7. JavaScript Pre-defined and User-defined Objects
a. Write a program using document object properties and methods.
b. Write a program using window object properties and methods.
c. Write a program using array object properties and methods.
d. Write a program using math object properties and methods.
e. Write a program using string object properties and methods.
f. Write a program using regex object properties and methods.
g. Write a program using date object properties and methods.
h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.
## 8. JavaScript Conditional Statements and Loops
a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
b. Write a program to display week days using switch case.
c. Write a program to print 1 to 10 numbers using for, while and do-while loops.

d. Write aprogram to print data in object using for-in, for-each and for-of loops
e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

## 9. Javascript Functions and Events

a. Design a appropriate function should be called to display
- Factorial of that number
- Fibonacci series up to that number
- Prime numbers up to that number
- Is it palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
4. Factorial of that number
5. Fibonacci series up to that number
6. Prime numbers up to that number
7. Is it palindrome or not

c. Write a program to validate the following fields in a registration page
    i.   Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
    ii.  Mobile (only numbers and length 10 digits)
    iii. E-mail (should contain format like xxxxxxx@xxxxx.xxx)

## Text Books:
1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

## Web Links:
1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

**II Year B.Tech. CSE (IOT) – II Semester**

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### (23A99401) DESIGN THINKING FOR INNOVATION

**Course Objectives:**
The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

**Course Outcomes:**
- Define the concepts related to design thinking. (L1, L2)
- Explain the fundamentals of Design Thinking and innovation (L1, L2)
- Apply the design thinking techniques for solving problems in various sectors. (L3)
- Analyse to work in a multidisciplinary environment (L4)
- Evaluate the value of creativity (L5)
- Formulate specific problem statements of real time issues (L3, L6)

**UNIT I        Introduction to Design Thinking**
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

**UNIT II        Design Thinking Process**
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

**Activity:** Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

**UNIT III        Innovation**
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

**UNIT IV        Product Design**
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

**Activity:** Importance of modelling, how to set specifications, Explaining their own product design.

**UNIT V        Design Thinking in Business Processes**
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

**Activity:** How to market our own product, About maintenance, Reliability and plan for startup.

**Textbooks:**
1. Tim Brown,Change by design,  Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

**Reference Books:**
1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design-  Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

**Online Learning Resources:**
https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

## COMMUNITY SERVICE PROJECT

**……Experiential learning through community engagement**

**Introduction**

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

**Objective**

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.  The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

**Implementation of Community Service Project**

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern.  For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.

- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

**Procedure**

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - o First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - o Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

## EXPECTED OUTCOMES

## BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

**Learning Outcomes**

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

**Personal Outcomes**

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

**Social Outcomes**

- Reduced stereotypes and greater inter-cultural understanding

- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

**Career Development**

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

**Relationship with the Institution**

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

**BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS**

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES**

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY**

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

**SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT**

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

**For Engineering Students**

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants

7.  Botanical survey
8.  Zoological survey
9.  Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30.  Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

**Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs**

Programs for School Children

1.   Reading Skill Program (Reading Competition)
2.  Preparation of Study Materials for the next class.
3.  Personality / Leadership Development
4.  Career Guidance for X class students
5.  Screening Documentary and other educational films
6.  Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7.  Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1.  Government Guidelines and Policy Guidelines
2.  Women's Rights
3.  Domestic Violence
4.  Prevention and Control of Cancer
5.  Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

**Role of Students:**

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

### Timeline for the Community Service Project Activity

**Duration: 8 weeks**

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmesto be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**
   **Along with the Community Awareness Programmes**, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.
   Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

**III B.Tech I Semester**

| 23A32503T | **INTERNET OF THINGS** | L | T | P | C |
|-----------|------------------------|---|---|---|---|
|           |                        | 3 | 0 | 0 | 3 |

**Course Objectives:**

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

**Course Outcomes:**
After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

**UNIT I   Introduction to IoT**
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

**UNIT II Prototyping IoT Objects using Microprocessor/Microcontroller**
Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

**UNIT III     IoT Architecture and Protocols**
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

**UNIT IV    Device Discovery and Cloud Services for IoT**
Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

**UNIT V     UAV IoT**
Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

**Textbooks:**

1. Vijay Madisetti and ArshdeepBahga, " Internet of Things ( A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis;George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

**Reference Books:**

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, " From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 9781-4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs,  John Baichtal

**Online Learning Resources:**

1. *https://www.arduino.cc/*
2. *https://www.raspberrypi.org/*
3. *https://nptel.ac.in/courses/106105166/5*
4. *https://nptel.ac.in/courses/108108098/4*

**III B.Tech I Semester**

| 23A05402T | **DATABASE MANAGEMENT SYSTEMS** | L | T | P | C |
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**Course Objectives: T**he main objective of the course is to
- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes:**After completion of the course, students will be able to
- Understand the basic concepts of database management systems (L2)
- Analyze a given database application scenario to use ER model for conceptual design of the database (L4)
- Utilize SQL proficiently to address diverse query challenges (L3).
- Employ normalization methods to enhance database structure (L3)
- Assess and implement transaction processing, concurrency control and database recovery protocols in databases. (L4)


**UNIT I: Introduction:** Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

**Unit II: Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

**UNIT III: SQL:** Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

**UNIT IV: Schema Refinement (Normalization):**Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).
**UNIT V: Transaction Concept:** Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
**Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing:

**Textbooks:**
1. Database Management Systems, 3$^{rd}$ edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5$^{th}$ edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

**Reference Books:**
1. Introduction to Database Systems, 8$^{th}$edition, C J Date, Pearson.
2. Database Management System, 6$^{th}$ edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**Web-Resources:**
1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

**III B.Tech I Semester**

| 23A35501 | EMBEDDED SYSTEMS | L | T | P | C |
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**Course Objectives:**

1. To understand the history, classification, and design process of embedded systems.
2. To explore the core components of embedded systems, including processors, memory, and I/O components.
3. To introduce onboard and external communication interfaces used in embedded systems.
4. To explain different firmware design approaches and programming techniques for embedded systems.
5. To provide an understanding of real-time operating systems and task management in embedded systems.

**Course Outcomes:**
**After completing the course, the student will be able to,**
1. Classify embedded systems based on their purpose, generation, and complexity.
2. Identify and select appropriate hardware components for an embedded system design.
3. Differentiate and implement various communication protocols like I2C, SPI, and CAN.
4. Develop firmware using assembly and high-level programming languages.
5. Analyze and apply RTOS-based task scheduling and synchronization techniques.

**UNIT-I   Introduction to Embedded Systems**
History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

**UNIT-II   Typical Embedded System**
Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

**UNIT-III Communication Interface**
Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

**UNIT-IV   Embedded Firmware Design and Development**
Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.

**UNIT-V   RTOS based Embedded System Design**
Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

**Textbooks:**
1. Introduction to Embedded Systems - Shibu KV, Mc Graw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

**References:**
1. Embedded System Design -Frank Vahid, Tony Grivargis, john Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

| 23A05503 | INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS (Qualitative Treatment ) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

Course Objectives (COBJ):

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

Course Outcomes (CO):

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology.

**Unit 1: Introduction to Quantum Theory and Technologies**
The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison,Quantum states and measurement: nature of observation,Overview of quantum systems: electrons, photons, atoms,The concept of quantization: discrete energy levels,Why quantum? Strategic, scientific, and technological significance,A snapshot of quantum technologies: Computing, Communication, and Sensing,National and global quantum missions: India's Quantum Mission, EU, USA, China

**Unit 2: Theoretical Structure of Quantum Information Systems**
What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract,The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences,Philosophical implications: randomness, determinism, and observer role

**Unit 3: Building a Quantum Computer – Theoretical Challenges and Requirements**
What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:
Why maintaining entanglement is difficult,Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what's working and what remains elusive,The role of quantum software in managing theoretical complexities

**Unit 4: Quantum Communication and Computing – Theoretical Perspective**
Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication,The Idea of the Quantum Internet – Secure Global Networking,Introduction to Quantum Computing,Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction,Real-World Importance and Future Potential

**Unit 5: Applications, Use Cases, and the Quantum Future**

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum,Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization,Emerging careers in quantum: roles, skillsets, and preparation pathways,Educational and research landscape – India's opportunity in the global quantum race

Textbooks**:**

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

Reference Books**:**

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.
4. **Alastair I.M. Rae**, *Quantum Physics: A Beginner's Guide*, Oneworld Publications, Revised Edition, 2005.
5. **Eleanor G. Rieffel, Wolfgang H. Polak**, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
6. **Leonard Susskind, Art Friedman**, *Quantum Mechanics: The Theoretical Minimum*, Basic Books, 2014.
7. **Bruce Rosenblum, Fred Kuttner**, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. **GiulianoBenenti, GiulioCasati, GiulianoStrini**, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.
9. **K.B. Whaley et al.**, *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Government of India**, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

Online Learning Resources**:**

- IBM Quantum Experience and Qiskit Tutorials
- Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
- edX – The Quantum Internet and Quantum Computers
- YouTube – Quantum Computing for the Determined by Michael Nielsen
- Qiskit Textbook – IBM Quantum

**III B.Tech I Semester**

| 23A32502 | SOFTWARE ENGINEERING (Professional Elective-I) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:** The objectives of this coursearetointroduce
- Softwarelifecyclemodels,SoftwarerequirementsandSRSdocument.
- ProjectPlanning,qualitycontrolandensuringgoodqualitysoftware.
- Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.

**Course Outcomes:** Aftercompletionofthecourse,studentswillbeableto
- PerformvariouslifecycleactivitieslikeAnalysis,Design,Implementation,Testing and Maintenance (L3)
- Analyzevarioussoftwareengineering modelsand applymethodsfordesignand development of software projects. (L4)
- Developsystemdesignsusingappropriatetechniques.(L3)
- Understandvarioustestingtechniquesforasoftwareproject.(L2)
- Applystandards,CASEtoolsandtechniquesforengineeringsoftwareprojects(L3)

**UNIT-I:**                                                                 Lecture8Hrs
**Introduction:** Evolution, Software development projects, Exploratory style of softwaredevelopments,Emergenceofsoftware engineering, Notable changes insoftwaredevelopment practices, Computer system engineering.
**Software Life Cycle Models:** Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

**UNIT-II:**
        Lecture 8Hrs
**Software Project Management:** Software project management complexities,
Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.
**Requirements Analysis And Specification:** Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

**UNIT-III:**
        Lecture 10Hrs
**Software Design:** Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.
**Agility:** Agility and the Cost of Change, Agile Process, Extreme-Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)
**Function-Oriented Software Design:** Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.
**User Interface Design:** Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

**UNIT-IV:**
        Lecture 8Hrs
**Coding And Testing:** Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging,Program analysis tools, Integration testing**,** Testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

**Software Reliability And Quality Management:** Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model. Few other important quality standards, and Six Sigma**.**

**UNIT-V:**
Lecture 10Hrs

**Computer-Aided Software Engineering (Case):** CASE and its scope, CASE environment, CASE support inthesoftwarelifecycle, other characteristicsofCASE tools, Towardssecond generation CASE Tool, and Architecture of a CASE Environment.

**Software Maintenance:** Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

**Software Reuse:** reuse- definition, introduction, reason behind no reuse so far, Basic issuesin any reuse program, A reuse approach, and Reuse at organization level.

**TextBooks:**
1. FundamentalsofSoftwareEngineering,RajibMall,5$^{th}$Edition,PHI.
2. SoftwareEngineering Apractitioner'sApproach,RogerS.Pressman,9$^{th}$Edition,Mc- Graw Hill International Edition.

**ReferenceBooks:**
1. SoftwareEngineering,IanSommerville,10$^{th}$Edition,Pearson.
2. Software Engineering,PrinciplesandPractices, DeepakJain,OxfordUniversity Press.

**e- Resources:**
1) https://nptel.ac.in/courses/106/105/106105182/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605895063 87148827_shared/overview
3) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411 003904735_shared/overview

**III B.Tech I Semester**

| 23A35502 | **WIRELESS SENSOR NETWORKS& APPLICATIONS (Professional Elective-I)** | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:** Theobjectivesofthiscoursearetointroduce
- To understand the characteristics, architecture, and challenges of Wireless Sensor Networks and distinguish them from traditional Ad-hoc networks.
- To study various MAC and routing protocols tailored for energy-efficient communication in sensor networks.
- To explore embedded operating systems used in WSNs and gain practical knowledge in programming with TinyOS and NesC.
- To examine the wide range of applications of WSNs across industrial, environmental, and real-time monitoring domains.

**Course Outcomes:**
- Understand the fundamental characteristics, design challenges, and architecture of sensor nodes used in Wireless Sensor Networks.
- Analyze various MAC protocols and their energy efficiency strategies in managing wireless communication in sensor networks.
- Evaluate different routing and data aggregation protocols to optimize communication and energy usage in WSNs.
- Explore the features and programming model of embedded operating systems like TinyOS used in WSN environments.
- Identify real-world applications of WSNs across various domains and understand standard protocols like IEEE 802.15.4.

**UNIT-I : Characteristics Of WSN**                                                Lecture 8Hrs

Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

**UNIT-II : Medium Access Control Protocols**                              Lecture 10Hrs

Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention-based protocols - Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol.

**UNIT-III: Routing And Data Gathering Protocols**                          Lecture 10Hrs

Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

**UNIT-IV:Embedded Operating Systems**                                       Lecture 10Hrs

Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS - OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.

**UNIT-V :Applications Of WSN**                                     Lecture 10Hrs

WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications- Wildfire Instrumentation - Habitat Monitoring – Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

**TEXT BOOKS**

1.  KazemSohraby, Daniel Minoli andTaiebZnati, " Wireless Sensor Networks Technology, Protocols,

and Applications", John Wiley & Sons,2007.

2.  Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John

Wiley & Sons, Ltd, 2005.

**REFERENCEBOOKS**

1.  K.AkkayaandM.Younis,"Asurveyofroutingprotocolsinwirelesssensornetworks", Elsevier Ad Hoc

Network Journal, Vol. 3, no. 3, pp. 325-349

2.  PhilipLevis,"TinyOSProgramming"

3.  AnnaHa´c,"WirelessSensorNetworkDesigns",JohnWiley&SonsLtd,

**III B.Tech I Semester**

| 23A31301T | ARTIFICIAL INTELLIGENCE | L | T | P | C |
|-----------|-------------------------|---|---|---|---|
|           | (Professional Elective-I) | 3 | 0 | 0 | 3 |

**Pre-requisite:**
- Knowledge in Computer Programming.
- A course on "Mathematical Foundations of Computer Science".
- Background in linear algebra, data structures and algorithms, and probability.

**Course Objectives:**
- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

**UNIT - I**

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

**UNIT - II**

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

**UNIT - III**

Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.

**UNIT - IV**

**Logic concepts:** First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

**UNIT - V**

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

**Textbooks:**
1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", SecondEdition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill

**Reference Books:**
1. David Poole, Alan Mack worth, Randy Goebel," Computational Intelligence: a logical approach", Oxford University Press.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problemsolving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

**Online Learning Resources:**
1. https://ai.google/
   https://swayam.gov.in/nd1_noc19_me71/preview

**III B.Tech I Semester**

| 23A05601T | **CRYPTOGRAPHY&NETWORK SECURITY** | L | T | P | C |
|-----------|-----------------------------------|---|---|---|---|
|           |                                   | 3 | 0 | 0 | 3 |

**CourseObjectives:**
Thiscourseaimsat trainingstudentstomasterthe:
- Theconceptsofclassicalencryptiontechniquesandconceptsoffinitefieldsandnumbertheory
- Workingprinciplesandutilitiesofvariouscryptographicalgorithmsincludingsecretkeycryptography,hashes,andmessagedigests,andpublickeyalgorithms
- Designissuesandworkingprinciplesofvariousauthenticationprotocols,PKIstandards
- VarioussecurecommunicationstandardsincludingKerberos,IPsec,TLS andemail
- Conceptsofcryptographicutilitiesandauthenticationmechanismsto design secureapplications

**CourseOutcomes:**
- Aftercompletionof thecourse,studentswill beableto
- Identifyinformationsecuritygoals,classicalencryptiontechniquesandacquirefundamentalknowledgeonthe conceptsoffinitfieldsandnumbertheory
- Compare andapplydifferentencryptionanddecryptiontechniquestosolveproblemsrelatedtoconfidentialityandauthentication
- Applytheknowledgeofcryptographicchecksumsandevaluatetheperformanceofdifferentmessagedigestalgorithmsforverifyingthe integrityof varyingmessagesizes.
- Applydifferentdigitalsignaturealgorithmsto achieveauthenticationandcreatesecureapplications
- Applynetworksecurity basics,analysedifferentattackson networksand evaluatetheperformanceoffirewallsandsecurityprotocolslikeTLS,IPSec,andPGP
- Applytheknowledge ofcryptographicutilitiesandauthenticationmechanismstodesignsecureapplications

**UNIT-I**
                                                                          Lecture9Hrs
**ComputerandNetworkSecurityConcepts:**ComputerSecurityConcepts,TheOSISecurityArchitecture,SecurityAttacks,SecurityServices,SecurityMechanisms,AModelforNetworkSecurity
**ClassicalEncryptionTechniques:**SymmetricCipherModel,                SubstitutionTechniques,
TranspositionTechniques,Steganography.
**BlockCiphers:**TraditionalBlockCipherStructure,TheDataEncryptionStandard,AdvancedEncryption
Standard:AESStructure,AESTransformationFunctions

**UNIT-II**
                                                                          Lecture9Hrs
**NumberTheory:**
TheEuclideanAlgorithm,ModularArithmetic,Fermat'sandEuler'sTheorems,TheChineseRemainderTheorem,DiscreteLogarithms,FiniteFields:FiniteFieldsoftheFormGF(p),FiniteFieldsoftheFormGF($2^n$).
**PublicKeyCryptography:**Principles,PublicKeyCryptographyAlgorithms,RSAAlgorithm,DiffieHellmanKeyExchange,Elliptic CurveCryptography.

**UNIT-III**
                                                                          Lecture9Hrs
**CryptographicHashFunctions:**
ApplicationofCryptographicHashFunctions,Requirements&Security,SecureHashAlgorithm,Message
AuthenticationFunctions,Requirements&Security,HMAC&CMAC.
**DigitalSignatures:**NISTDigitalSignatureAlgorithm,DistributionofPublicKeys,X.509Certificates,Public-KeyInfrastructure

**UNIT-IV**

Lecture9Hrs

**UserAuthentication:**RemoteUserAuthenticationPrinciples,Kerberos.**ElectronicMailSecurity:**Prett yGooPrivacy(PGP)AndS/MIME.

**IP Security:**IP SecurityOverview, IP Security Policy, Encapsulating Security Payload,CombiningSecurityAssociations,InternetKeyExchange.

**UNIT-V**

Lecture8Hrs

**Transport                                                                                          Level Security:**WebSecurityRequirements,TransportLayerSecurity(TLS),HTTPS,SecureShell(SSH)
**Firewalls:**FirewallCharacteristicsandAccessPolicy,TypesofFirewalls,FirewallLocationandConfigura tions.

**Textbooks:**

1) CryptographyandNetworkSecurity-WilliamStallings, PearsonEducation,7<sup>th</sup>Edition.
2) Cryptography,NetworkSecurityandCyberLaws–Bernard Menezes,CengageLearning,2010edition.

**ReferenceBooks:**

1) CryptographyandNetworkSecurity-BehrouzAForouzan,DebdeepMukhopadhyaya,Mc-GrawHill,3<sup>rd</sup>Edition,2015.
2) NetworkSecurityIllustrated,JasonAlbaneseandWesSonnenreich,MGHPublishers,200 3.

**OnlineLearningResources:**

1) https://nptel.ac.in/courses/106/105/106105031/lecture
2) https://nptel.ac.in/courses/106/105/106105162/lectureb yDr.SouravMukhopadhyayIITKharagpur[VideoLecture ]
3) https://www.mitel.com/articles/web-communication-cryptography-and-network-securitywebarticlesbyMitelPowerConnections

**III B.Tech I Semester**

| 23A32503P | INTERNET OF THINGS LAB | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |

**Course Objectives:**
- To introduce components such as WiFi, Bluetooth, Temperature, Moisture sensors
- To know the Micro controller such as Arduino
- To know the System on Chip (SOC) / Single Board Computer such as Raspberry Pi
- To understand HTTP IoT protocols and perform Experiments for data transmission
- To understand UAV/Drones and Internet of Drones Experiments

**Course Outcomes:** After completion of the course, students will be able to
- Know the various IoT sensors and understand the functionality
- Design and analyze IoT experiments and transfer the data to IoT Clouds
- Design the IoT systems for real time applications
- Understand Drones and Perform Internet of Drones Experiments

**Experiments using ESP32**
**1. Serial Monitor, LED, Servo Motor - Controlling**
**Experiment1:** Controlling actuators through Serial Monitor. Creating different led patterns and controlling them using push button switches. Controlling servo motor with the help of joystick.

**2. Distance Measurement of an object**
**Experiment 2:** Calculatethe distance to an object with the help of an ultrasonic sensor and display it on an LCD.

**3. LDR Sensor, Alarm and temperature, humidity measurement**
**Experiment 3:** Controlling relay state based on ambient light levels using LDR sensor. Basic Burglar alarm security system with the help of PIR sensor and buzzer. Displaying humidity and temperature values on LCD

**4. Experiments using Raspberry Pi**
**Experiment 4:**
- Controlling relay state based on input from IR sensors
- Interfacing stepper motor with R-Pi
- Advanced burglar alarm security system with the help of PIR sensor, buzzer and keypad. (Alarm gets disabled if correct keypad password is entered)
- Automated LED light control based on input from PIR (to detect if people are present) and LDR(ambient light level)

**5. IOT Framework**
**Experiment 5:** Upload humidity & temperature data to ThingSpeak, periodically logging ambient light level to ThingSpeak Experiment 6: Controlling LEDs, relay & buzzer using Blynk app

**6. HTTP Based**
**Experiment 7:** Introduction to HTTP. Hosting a basic server from the ESP32 to control various digital based actuators (led, buzzer, relay) from a simple web page.
**Experiment 8:** Displaying various sensor readings on a simple web page hosted on the ESP32.

**7. MQTT Based**
**Experiment 9:** Controlling LEDs/Motors from an Android/Web app, Controlling AC Appliances from an android/web app with the help of relay.
**Experiment 10:** Displaying humidity and temperature data on a web-based application

**8. UAV/Drone:**
**Experiment 11:**

- Demonstration of UAV elements, Flight Controller
- Mission Planner flight planning design

**Experiment 12:**
Python program to read GPS coordinates from Flight Controller

**References:**
1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.
2. 2. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011
3. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
4. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

**Online Learning Resources/Virtual Labs:**
https://www.arduino.cc/
https://www.raspberrypi.org/

**III B.Tech I Semester**

| 23A05402P | **DATABASE MANAGEMENT SYSTEMS LAB** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | **0** | **0** | **3** | **1.5** |

**Course Objectives:** This Course will enable students to
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers.

**Course Outcomes:** After completion of the course, students will be able to
- Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment (L3)
- Constructing and execute queries to manipulate and retrieve data from databases. (L3)
- Develop application programs using PL/SQL. (L3)
- Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality (L4)
- Establish database connectivity through JDBC (Java Database Connectivity) (L3)

**Experiments covering the topics:**
- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

**Sample Experiments:**
1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5. 
    i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
    ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

**Text Books/Suggested Reading:**
1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

**III B.Tech I Semester**

| 23A05506 | FULL STACK DEVELOPMENT – II <br> (Skill Enhancement Course) | L | T | P | C |
|----------|-----------------------------------------------------------|---|---|---|---|
|          |                                                           | 0 | 1 | 2 | 2 |

**Course Objectives:** The main objectives of the course are to

- Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages
- Building robust & responsive User Interfaces using popular JavaScript library '**React.js**'. Building robust backend APIs using '**Express. js**'
- Establishing the connection between frontend (React) User interfaces and backend APIs (Express) with Data Bases(My SQL)
- Familiarize students with GitHub for remote repository hosting and collaborative development.

**Course Outcomes:**

- CO1: Building fast and interactive UIs
- CO2: Applying Declarative approach for developing web apps
- CO3: Understanding ES6 features to embrace modern JavaScript
- CO4: Building reliable APIs with Express. Js
- CO5: Create and manage Git repositories, track changes, and push code to GitHub.

**Experiments covering the Topics:**

- Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
- Basics of React. js like React Components, JSX, Conditional rendering
  Differences between Real DOM and Virtual DOM.
- Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript map() function.
- JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)
- Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.
- Introduction to Git and GitHub and upload project& team collaboration


**Sample Experiments:**

1. **Introduction to Modern JavaScript and DOM**
   a.  Write a JavaScript program to link JavaScript file with the HTML page
   b.  Write a JavaScript program to select the elements in HTML page using selectors
   c.  Write a JavaScript program to implement the event listeners
   d.  Write a JavaScript program to handle the click events for the HTML button elements
   e.  Write a JavaScript program to With three types of functions
      i.  Function declaration
      ii. Function definition
      iii. Arrow functions

2. **Basics of React. js**
   a. Write a React program to implement a counter button using react class components
   b. Write a React program to implement a counter button using react functional components
   c. Write a React program to handle the button click events in functional component
   d. Write a React program to conditionally render a component in the browser
   e. Write a React program to display text using String literals

3. **Important concepts of React. js**
   a. Write a React program to implement a counter button using React use State hook
   b. Write a React program to fetch the data from an API using React use Effect hook
   c. Write a React program with two react components sharing data using Props.
   d. Write a React program to implement the forms in react
   e. Write a React program to implement the iterative rendering using map() function.

4. **Introduction to Git and GitHub**
   a. **Setup**
      o Install Git on local machine.
      o Configure Git (user name, email).
      o Create GitHub account and generate a personal access token.
   b. **Basic Git Workflow**
      o Create a local repository using git init
      o Create and add files → git add .
      o Commit files → git commit -m "Initial commit"
      o Connect to GitHub remote → git remote add origin <repo_url>
      o Push to GitHub → git push -u origin main
   c. **Branching and Collaboration**
      o Create a branch → git checkout -b feature1
      o Merge branch to main → git merge feature1
      o Resolve merge conflicts (guided)

5. **Upload React Project to GitHub**

   o Create a new React app using npx create-react-app myapp
   o Initialize a git repo and push to GitHub
   o Use .gitignore to exclude node_modules
   o Create multiple branches: feature/navbar, feature/form
   o Practice merge and pull requests (can use GitHub GUI)

6. **Introduction to Node. js and Express. js**
   a. Write a program to implement the 'hello world' message in the route through the browser using Express
   b. Write a program to develop a small website with multiple routes using Express. js
   c. Write a program to print the 'hello world' in the browser console using Express. js
   d. Write a program to implement the CRUD operations using Express. js
   e. Write a program to establish the connection between API and Database using Express – My SQL driver

7. **Introduction to My SQL**
   a. Write a program to create a Database and table inside that database using My SQL Command line client

    **b.**  Write a My SQL queries to create table, and insert the data, update the data in the table

    **c.**  Write a My SQL queries to implement the subqueries in the My SQL command line client

    **d.**  Write a My SQL program to create the script files in the My SQL workbench

    **e.**  Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API

## 8. Team Collaboration Using GitHub

- Form groups of 2–3 students
- Create a shared GitHub repo
- Assign tasks and work in branches
- Use Issues, Pull Requests, and Code Reviews
- Document code with README.md

**Textbooks:**

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2$^{nd}$ edition, APress, O'Reilly.
4. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
5. AZAT MARDAN, Full Stack Java Script: Learn Back bone. js, Node.jsand Mongo DB.2015

**Reference Books:**

1. Full-Stack JavaScript Development by Eric Bush.
2. Programming the World Wide Web, 7$^{th}$ Edition, Robet W Sebesta, Pearson, 2013.
3. Tomasz Dyl ,KamilPrzeorski , MaciejCzarnecki, Mastering Full Stack React Web Development 2017

**Online Learning Resources:**

1. https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/
2. https://www.w3schools.com/html
3. https://www.w3schools.com/css
4. https://www.w3schools.com/js/
5. https://www.w3schools.com/nodejs
6. https://www.w3schools.com/typescript
7. https://docs.github.com/
8. https://education.github.com/git-cheat-sheet-education.pdf

**III B.Tech – I semester**                                   **L   T   P   C**
                                                              **0   0   2   1**

# (23A03508) - TINKERING LAB

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

| | Course objectives: The objectives of the course are to |
|---|---|
| 1 | **Encourage Innovation and Creativity** |
| 2 | **Provide Hands-on Learning and Impart Skill Development** |
| 3 | **Foster Collaboration and Teamwork** |
| 4 | **Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship** |
| 5 | **Impart Problem-Solving mind-set** |

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

**List of experiments:**
1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Design and 3D print a Walking Robot
3) Design and 3D Print a Rocket.
4) Temperature & Humidity Monitoring System (DHT11 + LCD)
5) Water Level Detection and Alert System
6) Automatic Plant Watering System
7) Bluetooth-Based Door Lock System
8) Smart Dustbin Using Ultrasonic Sensor
9) Fire Detection and Alarm System
10) RFID-Based Attendance System
11) Voice-Controlled Devices via Google Assistant
12) Heart Rate Monitoring Using Pulse Sensor
13) Soil Moisture-Based Irrigation
14) Smart Helmet for Accident Detection
15) Milk Adulteration Detection System
16) Water Purification via Activated Carbon
17) Solar Dehydrator for Food Drying
18) Temperature-Controlled Chemical Reactor
19) Ethanol Mini-Plant Using Biomass
20) Smart Fluid Flow Control (Solenoid + pH Sensor)
21) Portable Water Quality Tester
22) AI Crop Disease Detection
23) AI-based Smart Irrigation
24) ECG Signal Acquisition and Plotting
25) AI-Powered Traffic Flow Prediction
26) Smart Grid Simulation with Load Monitoring

27) Smart Campus Indoor Navigator
28) Weather Station Prototype
29) Firefighting Robot with Sensor Guidance
30) Facial Recognition Dustbin
31) Barcode-Based Lab Inventory System
32) Growth Chamber for Plants
33) Biomedical Waste Alert System
34) Soil Classification with AI
35) Smart Railway Gate
36) Smart Bin Locator via GPS and Load Sensors
37) Algae-Based Water Purifier
38) Contactless Attendance via Face Recognition

- **Note:** The students can also design and implement their own ideas, apart from the list of experiments mentioned above.

- **Note:** A minimum of 8 to 10 experiments must be completed by the students.

**III B.Tech II Semester**

| 23A35601 | **BIG DATA ANALYTICS FOR IOT** | **L** | **T** | **P** | **C** |
|----------|-------------------------------|-------|-------|-------|-------|
|          |                               | **3** | **0** | **0** | **3** |

**Course Objectives**
- To understand the different architectures for IoT.
- To learn various protocols at the different layers for IoT.
- To develop proto type systems using Arduino / Rasberry Pi.
- To apply the use of data analytics in IoT.
- To develop applications of IoT in Industrial contexts.

 **Course Out comes:** Upon completion of the course, the students will be able to
- Explain the underlying architectures and models in IoT.
- Analyse different connectivity technologies for IoT.
- Develop simple applications using Arduino / Raspberry Pi.
- Apply data analytics techniques to IoT.
- Study the needs and suggest appropriate solutions for Industrial applications.

**UNIT-I: ARCHITECTURESANDMODELS**                                          Lecture 9Hrs
IntroductiontoIoT–IoTArchitectures–CoreIoTFunctionalStack,SensorsandActuatorsLayer,
Communications Network Layer, Applications and Analytics Layer – IoT Data Management and
Compute Stack, Fog Computing, Edge Computing, Cloud Computing – Sensors, Actuators, Smart
Objects, Sensor networks.

**UNIT-II: CONNECTIVITY**                                                       Lecture9Hrs
CommunicationsCriteria–AccessTechnologies–IPasIoTNetworkLayer–Businesscase–Optimization –
Profiles and compliances – Application Protocols – Transport Layer – Application Transport
Methods.

**UNIT-IIISYSTEMDEVELOPMENT**                                               Lecture9Hrs
DesignMethodology–Casestudy–BasicblocksofIoTdevice–RaspberryPi–Board,     Interfaces,   Linux,
Setting up, Programming – Arduino – Other IoT Devices.

**UNIT-IVDATAANALYTICS AND IoT SECURITY**                                   Lecture9Hrs
Data Analytics for IoT – Big Data Analytics Tools and Technology – Edge Streaming Analytics –
Network Analytics. Applications. Security history, challenges, variations –Risk Analysis Structures –
Application in Operational Environment.

**UNIT-VIoTIN INDUSTRY**
        Lecture9Hrs
Manufacturing,Architecture,Protocols–Utilities,GridBlocks-SmartCities,Architecture,Use    cases    –
Transportation, Architecture, Use cases.

**Text books:**

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry,"IoT
Fundamentals:NetworkingTechnologies,ProtocolsandUseCasesforInternetofThings",   Cisco   Press,
2017
2. Olivier Hersent, David Boswarthick, Omar Elloum, "The Internet of Things– Key applications
and Protocols", Wiley, 2012.
3. MichaelMiller,"TheInternetofThings",PearsonEducation,2015.

**Reference Books:**

1. ArshdeepBahga,VijayMadisetti,"InternetofThings–Ahands-onapproach",Universities Press, 2015.

2. Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle,"From Machine - to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.

3. Dieter Uckelmann, Mark Harrison,Michahelles,Florian(Eds),"ArchitectingtheInternetof Things",Springer, 2011.

**III B.Tech II Semester**

| 23A37501T | **CLOUD COMPUTING** | L | T | P | C |
|-----------|---------------------|---|---|---|---|
|           |                     | 3 | 0 | 0 | 3 |

**Course Objectives:**
- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

**Course Outcomes(CO):** After completion of the course, students will be able to
- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop backup strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

**UNIT-I Basics of Cloud computing**                                    Lecture9Hrs
**Introduction to cloud computing:** Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications
**Cloud concepts and Technologies:** Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.
**Cloud Services and Platforms:** Compute Services, Storage Services, Database Services, Applicationservices,Contentdeliveryservices,AnalyticsServices,DeploymentandManagementServices, IdentityandAccessManagementservices, OpenSourcePrivateCloudsoftware.

**UNIT-II HadoopandPython**                                            Lecture9Hrs
**Hadoop MapReduce:** Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.
**CloudApplicationDesign**:ReferenceArchitectureforCloudApplications,CloudApplication Design Methodologies, Data Storage Approaches.
**PythonBasics:** Introduction, InstallingPython, Python dataTypes & DataStructures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

**UNIT-III PythonforCloudComputing**                                   Lecture
8Hrs
**Python for Cloud:** Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.
**CloudApplicationDevelopmentinPython**:DesignApproaches,ImageProcessingAPP, DocumentStorageApp,MapReduceApp,SocialMediaAnalyticsApp.

**UNIT-IV Bigdata, MultimediaandTuning**                               Lecture 12Hrs
**BigDataAnalytics:**Introduction,    ClusteringBigData,ClassificationofBigdataRecommendation    of Systems.
**MultimediaCloud:**Introduction,Case    Study:LivevideoStreamingApp,StreamingProtocols,   case Study: Video Transcoding App.
**CloudApplicationBenchmarkingandTuning:**Introduction,Workload  Characteristics,  Application PerformanceMetrics,DesignConsiderationsforaBenchmarkingMethodology,  Benchmarking   Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

**UNIT-V ApplicationsandIssuesinCloud**                                                  Lecture 12Hrs
**CloudSecurity:**Introduction,CSACloudSecurityArchitecture,Authentication,Authorization,    Identity
Access Management, Data Security, Key Management, Auditing.
**CloudforIndustry,Healthcare&Education:**CloudComputingforHealthcare,CloudcomputingforEner
gySystems,CloudComputingforTransportationSystems,CloudComputing
forManufacturingIndustry,CloudcomputingforEducation.

**Migrating into a Cloud:** Introduction, Broad Approaches to migrating into the cloud, the seven–
step model of migration into a cloud.
**Organizational readiness and Change Management in The Cloud Age:** Introduction, Basic
concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the
competitive environment, common change management models, change management maturity
models, Organizational readiness self – assessment.
**Legal Issues in Cloud Computing**: Introduction, Data Privacy and security Issues, cloud
contractingmodels,Jurisdictional  issueraised  by  virtualization  and  datalocation,commercialand
businessconsiderations,SpecialTopics.

**Textbooks:**
1. CloudcomputingAhands-onApproach‖ByArshdeepBahga,VijayMadisetti,Universities Press, 2016
2. CloudComputingPrinciplesandParadigms:ByRajKumarBuyya,JamesBroberg,Andrzej,
Goscinski,Wiley,2016

**ReferenceBooks:**
   1.   MasteringCloudComputingbyRajkumarBuyya,ChristianVecchiola,SThamaraiSelvi,TMH
   2.   CloudcomputingAHands-OnApproachbyArshdeepBahgaandVijayMadisetti.
   3.   Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert
   Elsenpeter, Tata McGraw Hill, rp2011.
   4.   EnterpriseCloudComputing,GautamShroff,CambridgeUniversityPress, 2010.
   5.   CloudApplicationArchitectures:BuildingApplicationsandInfrastructureintheCloud,George
     Reese, O 'Reilly, SPD, rp2011.
   6.   EssentialsofCloudComputingbyK.Chandrasekaran.CRCPress.

**OnlineLearningResources:**
Cloudcomputing-Course(nptel.ac.in)

**III B.Tech II Semester**

| 23A05701b | **BLOCK CHAIN TECHNOLOGY** | L | T | P | C |
|---|---|---|---|---|---|
|  |  | 3 | 0 | 0 | 3 |

**CourseObjectives:**
- Understandhowblockchainsystems(mainlyBitcoinandEthereum)work andtosecurely interact with them,
- Design,build,anddeploysmartcontractsanddistributedapplications.
- Integrate ideasfromblockchaintechnologyintotheirownprojects.

**CourseOutcomes:** After completionofthecourse,studentswillbeableto
- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- IdentifytherisksinvolvedinbuildingBlockchainapplications.
- Reviewoflegalimplicationsusingsmart contracts.
- ChoosethepresentlandscapeofBlockchainimplementationsandUnderstandCryptocurrency markets.
- Examinehowtoprofitfromtradingcryptocurrencies.

**UNIT-I: Introduction**                                                      Lecture8Hrs
Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

**UNIT-II: BlockchainConcepts**                                              Lecture9Hrs
Block chainConcepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

**UNIT-III   ArchitectingBlockchainsolutions**                               Lecture9Hrs
Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

**UNIT-IVEthereumBlockchainImplementation**                                  Lecture
8Hrs
Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura,Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin Contracts

**UNIT-V        HyperledgerBlockchainImplementation**
        Lecture10Hrs
Introduction,UseCase–
CarOwnershipTracking,HyperledgerFabric,HyperledgerFabricTransactionFlow,FabCarUseCaseImplementation, nvoking Chain code Functions Using Client Application.

**Advanced Concepts in Blockchain:** Introduction, Inter Planetary File System (IPFS), Zero-

Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

**Textbooks:**
1.      Ambadas, Arshad SarfarzAriff, Sham "Blockchain for Enterprise Application Developers", Wiley
2.      Andreas M. Antonpoulos, "Mastering Bitcoin: Programming the Open Blockchain" , O'Reilly

**Reference Books**:
1.      Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2.      Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

**Online Learning Resources:**
1.https://github.com/blockchainedindia/resources
2.Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
   Zero to        Blockchain    -     An     IBM    Redbooks       course, by      Bob
   Dill,  David   Smits
3.https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0 401.html
4.https://nptel.ac.in/courses/106105184
5.https://onlinecourses.nptel.ac.in/noc22_cs44/preview

**III B.Tech II Semester**

| 23A05602a | **SOFTWARE TESTING METHODOLOGIES** | L | T | P | C |
|-----------|-----------------------------------|---|---|---|---|
|           |                                   | 3 | 0 | 0 | 3 |

**CourseObjectives:**
To equip students with the theoretical foundations and practical techniques of software testing, including path, transaction flow, data flow, domain, and state-based testing methods, while fostering the ability to model software behavior, detect anomalies, evaluate testability, and apply graph-based and logic-based approaches to improve software reliability and quality.

**Course Outcomes:**
- To learn and understand the tools and techniques of software testing and its practice in the industry.
- To be aware of the differences between the various testing strategies.
- To know the taxonomy and purpose of software testing tools.
- Ability to apply graph-based and logic-based approaches to improve software reliability and quality.

**UNIT-I Introduction**
Lecture 8Hrs
**Introduction:** Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.
**Flow graphs and Path testing:** Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

**UNIT- II Flow Testing**
        Lecture 9Hrs
**Transaction Flow Testing:** Transaction Flows, Transaction Flow Testing Techniques.
**Data flow testing:** Basics of Data flow Testing, Strategies in Data flow Testing, Application of Data flow Testing.

**UNIT-III Domain Testing**
        Lecture 9Hrs
**Domain Testing:** Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

**UNIT-IV Logic Based Testing**
        Lecture 8Hrs
Paths, Path products and Regular expressions: Path Products & Path Expression,Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts,Specifications.

**UNIT V Graph Matrices and Application**
        Lecture 8Hrs
**State, State Graphs and Transition Testing:** State Graphs, Good & Bad State Graphs, State Testing, Testability Tips.
**Graph Matrices and Application:** Motivational Overview, Matrix of Graph, Relations,Power of a Matrix, Node Reduction Algorithm, Building Tools

**Textbooks:**
1. Boris Beizer, "Software testing techniques", Dreamtech, second edition, 2002.

**Reference Books:**

1. Brian Marick, "The craft of software testing", Pearson Education.
   2. Yogesh Singh, "Software Testing", Camebridge
   3. P.C. Jorgensen, "Software Testing" 3rd edition, Aurbach Publications
   4. N.Chauhan, "Software Testing", Oxford University Press.
   5. P.Ammann&J.Offutt, "Introduction to Software Testing" , Cambridge Univ. Press. 6. Perry, "Effective methods of Software Testing", John Wiley, 2nd Edition, 1999.

**Online Learning Resources:**

http://www.nptelvideos.in/2012/11/software-engineering.html
https://onlinecourses.nptel.ac.in/noc16_cs16/preview https://nptel.ac.in/courses/117105135

**III B.Tech II Sem**

| 23A04503T | **MICROPROCESSORS AND MICROCONTROLLERS** | L | T | P | C |
|-----------|-------------------------------------------|---|---|---|---|
|           |                                           | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To learn the fundamental architectural concepts of microprocessors.
2. To gain knowledge about assembly language programming concepts.
3. To get familiar about 8086 interfacing.
4. To understand the fundamentals of the 8051 Microcontroller.
5. To learn interfacing with the 8051 Microcontroller.

**Course Outcomes:**

**At the end of this course, the students will be able to**
1. Learn the fundamental architectural concepts of microprocessors.
2. Gain knowledge about assembly language programming concepts.
3. Understand the concepts of 8086 interfacing.
4. Learn the fundamentals of the 8051 Microcontroller.
5. Know the interfacing with the 8051 Microcontroller.

**UNIT I**

**8086 Architecture**: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

**UNIT II**

**8086 Programming**: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

**UNIT III**

**8086 Interfacing**: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

**UNIT IV**

**Microcontroller :** Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

**UNIT V**

**Interfacing Microcontroller :**- Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

**Textbooks**:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3$^{rd}$ edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2$^{nd}$ edition, Pearson, 2012.

**References:**

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6$^{th}$ edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3$^{rd}$ edition, Cengage Learning, 2004.

**III B.Tech II Semester**

| 23A05502 | **AUTOMATA THEORY & COMPILER DESIGN** | **L** | **T** | **P** | **C** |
|----------|----------------------------------------|-------|-------|-------|-------|
|          | **(Professional Elective –II)**        | **3** | **0** | **0** | **3** |

**Course Objectives:**
1. Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs.
2. Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability.
3. Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.
4. Able to understand the concepts of Bottom-up parser, Intermediate Code Generation.
5. Able to understand the concepts of Code optimizer and Code Generation.

**Course Outcomes:**
1. Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.
2. Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.
3. Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
4. Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
5. Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

**Unit-I: Introduction to Automata and Regular Expressions            12 Hrs**
Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).

**UNIT-II: Context Free Grammars and Pushdown Automata            12 Hrs**
Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG's, Chomsky Normal Form, Greibach Normal Form, Push Down Automat (PDA), Design of PDA, Equivalence of PDA and CFL/CFG

**UNIT-III: Turing Machines and Introduction to Compilers            12 Hrs**
Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.

**UNIT-IV: Parsers and Intermediate Code Generation                          12 Hrs**
Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers
Bottom–up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes.

**UNIT-V: Code Optimization and Code Generation            12 Hrs**
Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator.

**Text Books:**
1. Introduction to Automata theory languages and Computation, Hopcroft H.E. and Ullman Jeffrey.D, 3/e, 2006, Pearson Education, New Delhi, India.
2. Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", 2/e, 2007, PHI, New Delhi, India.

3. Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal

**Reference Books:**

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Louden, Thomson/ Delmar Cengage Learning, 2006.
4. Lex &yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O'reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

**III B.Tech II Semester**

| 23A31401T | **MACHINE LEARNING** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
|  | **(Professional Elective-II)** | **3** | **0** | **0** | **3** |

**Course Objectives:** The objectives of the course are
- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

,
**Course Outcomes**:
- CO1: Identify machine learning techniques suitable for a given problem. (L3)
- CO2: Solve real-world problems using various machine learning techniques. (L3)
- CO3: Apply Dimensionality reduction techniques for data preprocessing. (L3)
- CO4: Explain what is learning and why it is essential in the design of intelligent machines. (L2)
- CO5: Evaluate Advanced learning models for language, vision, speech, decision making etc. (L5)

**UNIT-I: Introduction to Machine Learning:** Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

**UNIT-II: Nearest Neighbor-Based Models:** Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

**UNIT-III: Models Based on Decision Trees**: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.
**The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

**UNIT-IV: Linear Discriminants for Machine Learning**: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

**UNIT-V: Clustering** : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

**Textbooks:**
1.“Machine Learning Theory and Practice”, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

**Reference Books:**
1.“Machine Learning”, Tom M. Mitchell, McGraw-Hill Publication, 2017
2.“Machine Learning in Action”,Peter Harrington, DreamTech
3.“Introduction to  Data Mining”, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

**III B.Tech II Semester**

| 23A32603 | **INTRODUCTION TO QUANTUM COMPUTING** <br> ( Professional Elective-III ) | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | **3** |

*Course Objectives***:**

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

*Course Outcomes***:**

Upon successful completion of this course, students will be able to:

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

*UNIT I: Fundamentals of Quantum Mechanics and Linear Algebra*

Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

*UNIT II: Quantum Gates and Circuits*

Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

*UNIT III: Quantum Algorithms and Complexity*

Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

*UNIT IV: Quantum Programming and Simulation Platforms*

Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

*UNIT V: Applications and Future of Quantum Computing*

Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

*Textbooks***:**

1. Michael A. Nielsen, Isaac L. Chuang, <u>Quantum Computation and Quantum Information</u>, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, <u>Quantum Computing: A Gentle Introduction</u>, MIT Press, 2011.
3. Chris Bernhardt, <u>Quantum Computing for Everyone</u>, MIT Press, 2019.

*Reference Books***:**

1. David McMahon, <u>Quantum Computing Explained</u>, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, <u>An Introduction to Quantum Computing</u>, Oxford University Press, 2007.
3. Scott Aaronson, <u>Quantum Computing Since Democritus</u>, Cambridge University Press, 2013.

*Online Learning Resources***:**

1. **IBM Quantum Experience and Qiskit Tutorials**
2. **Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley**
3. edX – The Quantum Internet and Quantum Computers
4. **YouTube – Quantum Computing for the Determined by Michael Nielsen**
5. Qiskit Textbook – IBM Quantum

**III  B.Tech II Semester**

| 23A05603b | MOBILE ADHOC NETWORKS<br>(Professional Elective-III) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective:**
- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

**Course Outcomes:**
- Describe the unique issues in ad-hoc/sensor networks.
- Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications

**UNIT-IIntroduction to Ad Hoc Networks:**
Characteristics of MANETs, Applications of MANETs and challenges of**MANETs -Routing in MANETs:** Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

**UNIT-IIData Transmission:**
Broadcast storm problem, Broadcasting, Multicasting and Geocasting -**TCPover Ad Hoc:**
TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT-IIIBasics of Wireless, Sensors and Applications:**
Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

**UNIT-IVData Retrieval in Sensor Networks:**
Routing layer, Transport layer, High-level application  layer support,  Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-**Security:** Security in Ad  Hoc networks,  Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

**UNIT-VSensor Network Platforms and Tools:** Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -**Operating System:**TinyOS - Imperative Language:nesC,  Dataflow style language: TinyGALS,NodeLevel Simulators, ns-2 and its sensor network extension.

**TEXT BOOKS:**
1. Ad     Hoc     and     Sensor     Networks     –Theory     and     Applications,     Carlos CorderioDharmaP.Aggarwal,World
   Scientific Publications, March 2006,ISBN –981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas,
   Elsevier Science, ISBN –978-1-55860-914-3 ( Morgan Kauffman)

**III  B.Tech  II Semester**

| 23A31501 | NATURAL LANGUAGE PROCESSING (Professional Elective-III) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objective**
- Explain and apply fundamental algorithms and techniques in the area of  natural language processing(NLP)
- Discuss approaches to syn tax and semantics in NLP.
- Examine current methods for statistical approach esto machine translation.
- Teach machine learning techniques used in NLP.

 **Course Out comes:**
After completion of the course, students will be able to
- Under stand the various NLP Applications and Organization of Natural language, able  to learn and implement realistic applications using Python.
- Apply the various Parsing techniques, Bayes Rule, Shannongame, Entropy and Cross Entropy.
- Under stand the fundamentals of CFG and parsers and mechan is msin ATN's.
- Apply Semantic Interpretation and Language Modelling.
- Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

**UNIT- I Introduction to Natural language**

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Under standing Systems, Linguistic Back ground: Anoutline of English Syn tax.

**UNIT-II Grammars and Parsing**
Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphologica l Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannongame, Entropy and Cross Entropy.

**UNIT-III Grammars for Natural Language**
Grammars for Natural Language, Movement Phenomenonin Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

**UNIT-IV**
 **Semantic Interpretation**
Semantic &Logical form, Word senses &ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs &States in logical form, The maticroles, Speech acts & embedded sentences, Defining semantics structure model theory.
 **Language Modelling**
Introduction,n-GramModels,LanguagemodelEvaluation,ParameterEstimation,LanguageModelAdaption,TypesofLanguageModels,Language-SpecificModellingProblems,MultilingualandCrosslingual          Language Modelling.

**UNIT-V**

 **Machine Translation**
Survey:Introduction,ProblemsofMachineTranslation,IsMachineTranslationPossible,BriefHistory,Pos

sibleApproaches,CurrentStatus.AnusarakaorLanguageAccessor:
Background,CuttingtheGordianKnot,TheProblem,StructureofAnusarakaSystem,UserInterface,Lingui
sticArea,GivingupAgreementinAnusarsakaOutput,LanguageBridges.

### Multilingual Information Retrieval

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

### Multilingual Automatic Summarization

Introduction, Approach esto Summarization, Evaluation, How to Builda Summarizer, Competitions and Datasets.

### Textbooks:

1. James Allen, Natural Language Understanding, 2$^{nd}$Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice- Daniel M.Bikel  and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineetchaitanya, Prentice –Hall of India.

### Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MITPress,1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2$^{nd}$Edition, Prentice Hall,2008.
3. Manning, Christopher and Hen rich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press,1999.

### Online Learning Resources:

https://nptel.ac.in/courses/106/105/106105158/http://www.nptelvideos.in/2012/11/natural-language-processing.html

**III B.Tech II Semester**

| 23A35602 | SECURITY ASSESSMENT AND RISK ANALYSIS<br>(Professional Elective-III) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSEOBJECTIVES**
- The course takes a software development perspective to the challenges of engineering software systems that are secure.
- Thiscourseaddressesdesignandimplementationissuescriticaltoproducingsecure software systems.
- The course deals with the question of howto make the requirements for confidentiality, integrity, and availability integral to the software development process.
- Secure software requirementsgatheringtodesign,development,configuration,deployment, and ongoing maintenance Securityofenterpriseinformationsystems.


**COURSEOUTCOMES:**
- Understand various aspectsandprinciplesofsoftwaresecurity.
- Devisesecuritymodelsforimplementingatthedesign level.
- Identifyandanalyzetherisksassociatedwith/engineeringanduserelevantmodels to mitigate the risks.
- Understandthevarioussecurityalgorithmstoimplementforsecuredcomputingand computer networks
- Explaindifferentsecurityframeworksfordifferenttypesofsystemsincludingelectronic systems.
- 

**UNIT-1:** Defining computer security, the principles of secure software, trusted computing base, etc, threat modeling, advanced techniques for mapping security requirements into design specifications. Secure software implementation, deployment and ongoing management.

**UNIT-2:** Software design and an introduction to hierarchical design representations. Difference between high-level and detailed design. Handling security with high-level design. General Design Notions. Security concerns designs at multiple levels of abstraction, Design patterns, quality assurance activities and strategies that support early vulnerability detection, Trust models, security Architecture & design reviews .

**UNIT-3 Software Assurance Model:** Identify project security risks & selecting risk management strategies, Risk Management Framework, Security Best practices/ Known Security Flaws, Architectural risk analysis, Security Testing & Reliability (Penn testing, Risk- Based Security Testing

**UNIT-4: Software Security in Enterprise Business:** Identification and authentication, Enterprise Information Security, Symmetric and asymmetric cryptography, including public key cryptography, data encryption standard (DES), advanced encryption standard (AES), algorithms forhashesand messagedigests. Authentication,authentication schemes, access control models, Kerberos protocol, public key infrastructure (PKI), protocols specially designed for e-commerce and web applications, firewalls and VPNs.

**UNIT-5:** Securitydevelopmentframeworks.Securityissuesassociated withthedevelopment and deployment of information systems, including Internet-based e-commerce, e-business, and e-service systems.

**TEXTBOOK:**
1. W.Stallings,Cryptographyandnetworksecurity:Principlesandpractice,5<sup>th</sup>Edition, Upper Saddle River, NJ: Prentice Hall., 2011
2. C. Kaufman,r. Perlman, & M. Speciner,Network security:Privatecommunicationin a public world, 2<sup>nd</sup> Edition, Upper Saddle River, NJ:PrenticeHalL, 2002
3. C.P.Pfleeger,S.L.Pfleeger,SecurityinComputing,4<sup>th</sup>Edition,UpperSaddleRiver, NJ:Prentice Hall, 2007
4. M.Merkow,&J.Breithaupt,Informationsecurity:Principlesandpractices.Upper Saddle River, NJ:Prentice Hall, 2005

**REFERENCE BOOKS:**
1. GaryMcGraw,SoftwareSecurity:BuildingSecurityIn,Addison-Wesley,2006

**III B.Tech II Semester**

| | | L | T | P | C |
|---|---|---|---|---|---|
| 23A37501P | **CLOUD COMPUTING LAB** | 0 | 0 | 3 | 1.5 |

**Course Objectives:**
- Demonstrate application development using Cloud
- Explain features of Hadoop

**Course Outcomes (CO):** On completion of this course, the students will be able to:
- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

**List of Experiments:**

1. Install VirtualBox/VMware Workstation with different flavours of Linux or windows OS on top of windows operating systems.

2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs

3. Install Google App Engine. Create hello world app and other simple web applications using python/java.

4. Use GAE launcher to launch the web applications.

5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.

6. Find a procedure to transfer the files from one virtual machine to another virtual machine.

7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)

8. Install Hadoop single node cluster and run simple applications like wordcount

9. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.

10. Develop a Guestbook Application using Google App Engine

11. Develop a Serverless Web App using AWS

12. Design a Content Recommendation system using AWS

13. Design a Cloud based smart traffic management system

14. Design Cloud based attendance management system

15. Design E-learning cloud-based system

16. Using Amazon Lex build a Chatbot

**References:**

1. https://www.vmware.com/products/workstation-pro/workstation-pro-evaluation.html.

2. http://code.google.com/appengine/downloads.html

3. http://code.google.com/appengine/downloads.html

**Online Learning Resources/Virtual Labs:**
1. Google Cloud Computing Foundations Course - Course (nptel.ac.in)

**III B.Tech II Semester**

| 23A35603 | **BLOCKCHAIN TECHNOLOGY LAB** | **L** | **T** | **P** | **C** |
|----------|-------------------------------|-------|-------|-------|-------|
|          |                               | **0** | **0** | **3** | **1.5** |

**COURSE OBJECTIVES: This** course will enable the students:
Understanding Block chain Fundamentals and creating basic blocks.
1. Able to Develop Block chain Applications in a structured manner
2. Ability to create own crypto currency and get familiarity with future currencies.
3. Able to Evaluate and Analyze Block chain Systems

**COURSE OUTCOMES**
1. Knowledge of Blockchain Concepts and creating basic blocks.
2. Proficiency in Blockchain Development.
3. Ability to Design and Implement Blockchain Applications.
4. Evaluation and Analysis of Blockchain Systems.
5. Knowledge of crypto currency and creating a basic form of it.

## Week 1& 2: Creating a Merkle Tree

- **Objective:** Understand the concept and structure of Merkle trees used in blockchain.
- **Tasks:**
  - Write a program in Python/Java to generate a Merkle Tree.
  - Visualize the hash structure from leaf nodes to the root.
  - Demonstrate how a single change in data affects the root hash.

## Week 3 : Creation of a Basic Block

- **Objective:** Learn to design and create a single block with essential components.
- **Tasks:**
  - Implement a basic block structure containing block ID, timestamp, data, previous hash, and current hash.
  - Show hash computation using SHA-256.
  - Link it with a previous dummy block to simulate chaining.

## Week 4 & 5: Blockchain Implementation

- **Objective:** Build a simplified blockchain by linking multiple blocks.
- **Tasks:**
  - Write code to link blocks into a simple blockchain.
  - Validate block integrity (no tampering) across the chain.
  - Display the entire blockchain with hashes and timestamps.

## Week 6 & 7: Creating an ERC-20 Token (Ethereum)

- **Objective:** Understand how crypto tokens are created on Ethereum.
- **Tasks:**
  - Write a smart contract in Solidity for an ERC-20 token.
  - Deploy it on a testnet (e.g., Ropsten using Remix IDE).
  - Perform basic operations like transfer, approve, and balance check.

## Week 8 & 9: Merkle Tree with Java

- **Objective:** Implement Merkle Tree in Java and explore its integration in blockchains.
- **Tasks:**
    - Write a Java program to simulate transaction hashing and Merkle root generation.
    - Emphasize tree construction performance with a large dataset.

## Week 10 & 11: Implementing Mining in Blockchain (Java)

- **Objective:** Learn about Proof-of-Work and mining difficulty.
- **Tasks:**
    - Simulate mining by finding a hash with a specific number of leading zeros.
    - Implement nonce handling and performance measurement.

## Week 12 & 13: Peer-to-Peer (P2P) Blockchain Simulation

- **Objective:** Simulate how P2P blockchain nodes communicate and share blocks.
- **Tasks:**
    - Use Java to implement a simple P2P blockchain network with multiple simulated nodes.
    - Ensure data synchronization across nodes when new blocks are added.

## Week 14 & 15: Creating a Basic Cryptocurrency Wallet

- **Objective:** Understand key generation, address creation, and transactions.
- **Tasks:**
    - Generate public/private key pairs.
    - Create a simple wallet UI (CLI or GUI) that stores keys and performs basic transaction signing.
    - Use Python libraries like bitcoinlib or JavaScript libraries like ethers.js.

**Textbook:**

1. **ArshdeepBahga and Vijay Madisetti**, *Blockchain Applications: A Hands-On Approach*, VPT, 2017.

**Reference Books:**

1. **Andreas M. Antonopoulos**, *Mastering Bitcoin: Unlocking Digital Cryptocurrencies*, O'Reilly Media, 2017 (2nd Edition).
2. **Imran Bashir**, *Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications*, Packt Publishing, 2020 (3rd Edition).
3. **Narayanan, Bonneau, Felten, Miller, and Goldfeder**, *Bitcoin and Cryptocurrency Technologies*,
   Princeton University Press, 2016.

**III B.Tech II Semester**

| 23A52501 | **SOFT SKILLS** | **L** | **T** | **P** | **C** |
|----------|-----------------|-------|-------|-------|-------|
|          |                 | **0** | **1** | **2** | **3** |

| Course Objectives: |
|---|

- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To enhance healthy relationship and understanding within and outside an organization
- To function effectively with heterogeneous teams

Course Outcomes (CO):

| COs | Statements | Blooms level |
|-----|-----------|--------------|
| **CO1** | List out various elements of soft skills | L1, L2, |
| **CO2** | Describe methods for building professional image | L1, L2 |
| **CO3** | Apply critical thinking skills in problem solving | L3 |
| **CO4** | Analyse the needs of an individual and team for well-being | L4 |
| **CO5** | Assess the situation and take necessary decisions | L5 |
| **CO6** | Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being | L6 |

| UNIT – I | **Soft Skills & Communication Skills** | Lecture Hrs |
|----------|----------------------------------------|-------------|

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques
**Activities:**
**Intrapersonal Skills**- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity
(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)
**Interpersonal Skills**- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.
**Verbal Communication**- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.
**Non-verbal communication** – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

| UNIT – II | **Critical Thinking** | Lecture Hrs |
|-----------|------------------------|-------------|

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking  - Positive thinking - Reflection
**Activities**:
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

| UNIT – III | **Problem Solving & Decision Making** | Lecture Hrs |
|------------|----------------------------------------|-------------|

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution –
Team building - Effective decision making in teams – Methods & Styles
**Activities:**
Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.
Case Study & Group Discussion

| UNIT – IV | **Emotional Intelligence & Stress Management** | Lecture Hrs |
|---|---|---|

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

**Activities**:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

| UNIT – V | **Corporate Etiquette** | Lecture Hrs |
|---|---|---|

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette -  Netiquette - Job interview etiquette  -Corporate grooming tips - Overcoming challenges

**Activities**

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

**NOTE-:**

1.The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.

2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

**Prescribed Books**:

1. Mitra Barun K, *Personality Development and Soft Skills*, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, *Personality Development and Soft Skills: Preparing for Tomorrow,*  K I 2018 ,esuoH gnihsilbuP lanoitanretnI

**Reference Books**

1. Sharma,  Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications 2018.
2. Alex K,*Soft Skills*S.Chand& Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan& Sangeetha Sharma,*Soft Skills: An Integrated Approach to Maximise Personality*Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, *Soft Skills and Employability Skills,* Cambridge University Press, 2018
5. Dr. Rajiv Kumar Jain, Dr. Usha Jain,*Life Skills*(Paperback English)Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. **https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q**
2. **https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ**
3. **https://youtu.be/-Y-R9hDl7lU**
4. **https://youtu.be/gkLsn4ddmTs**
5. **https://youtu.be/2bf9K2rRWwo**
6. **https://youtu.be/FchfE3c2jzc**
7. **https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/**
8. **https://onlinecourses.nptel.ac.in/noc24_hs15/preview**
9. **https://onlinecourses.nptel.ac.in/noc21_hs76/preview**

**III B.Tech II Semester**

| 23A52601 | **TECHNICAL REPORT WRITING & IPR** | **L** | **T** | **P** | **C** |
|----------|-----------------------------------|-------|-------|-------|-------|
|          |                                   | **2** | **0** | **0** | **0** |

### Course Objectives:·

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

**Course Outcomes: On successful completion of this course, the students will be able to:**

| **COURSE OUTCOMES:** At the end of the course, students will be able to | **Blooms Level** |
|---|---|
| CO1 | Identify key secondary literature related to their proposed technical paper writing | L1, L2 |
| CO2 | Explain various principles and styles in technical writing | L1, L2 |
| CO3 | Use the acquired knowledge in writing a research/technical paper | L3 |
| CO4 | Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc. | L4 |
| CO5 | Evaluate different forms of IPR available at national & international level | L5 |
| CO6 | Develop skill of making search of various forms of IPR by using modern tools and techniques. | L3, L6 |

### UNIT – I:

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence andlogical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings- discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .

### UNIT – II:

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problemsand Framing Research Questions- Synopsis

### UNIT – III:

Process of research: publication mechanism: types of journals- indexing-seminars- conferences- proof reading – plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules

**IT – IV:** Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, cies and treaties, importance of intellectual property rightsTrade Marks: Purpose and function of trademarks, acquisition ade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT – V:**

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.Patent law, intellectual property audits.

**Textbooks:**

1. Deborah. E. Bouchoux, *Intellectual Property Rights*, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. *Technical Communication:Principles and practices.*Oxford.


**Reference Books:**

1. R.Myneni, *Law of Intellectual Property*, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli,*Intellectual Property Rights* Tata Mcgraw Hill, 2001
3. P.Naryan,*Intellectual Property Law*, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. *English for Writing Research Papers*Second Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, *Technical Writing Style*
   **Online Resources**
   1. **https://theconceptwriters.com.pk/principles-of-technical-writing/**
   2. **https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html**
   3. **https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html**
   4. **https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/**
   5. **https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf**
   6. **https://lawbhoomi.com/intellectual-property-rights-notes/**
   7. **https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf**

**IV B.Tech I Semester**

| 23A35701 | IOT APPLICATIONS DEVELOPMENT ON CLOUD PLATFORM | L | T | P | C |
|----------|------------------------------------------------|---|---|---|---|
|          |                                                | 3 | 0 | 0 | 3 |

**Course Objectives:**
- To study the fundamental concepts of cloud computing, enablingtechnologies, cloud service models and security concerns
- To learn core issues of Internet of Things, IOT communication protocols and Security concern

**Course Outcomes(Cos):** At the end of this course, the student will be able to:

1 understand core issues of cloud computing and enabling technologies;

2 design services based on cloud computing platforms;

3 understand concepts, architecture, applications and design principles for connected devices in IoT ;

4 explain, analyse and design IoT- oriented communication protocols and security concerns.

**UNIT-I**

**Cloud Computing:** Definition, roots of cloud computing, characteristics, cloud architecture, deployment models, service models.

**Virtualization:** benefits & drawbacks of virtualization, server virtualization, virtualization of – operating system, platform, CPU, network, application, memory and I/O devices etc

**UNIT-II**

**Cloud Computing Service Platforms** – compute services, storage services, database services, application services, queuing services, e-mail services, notification services, media services, content delivery services, analytics services, deployment & management services, identity & access management services and their case studies.

**Security in cloud computing:** Issues, threats, data security and information security.

**UNIT-III**

**Internet of Thing (IoT):** overview, conceptual framework, architecture, major components, common applications .

**Design principles for connected devices:** Modified OSI Model for IoT/M2M systems, ETSI M2M Domains and High-level capabilities, wireless communication technologies – NFC, RFID, Bluetooth BR/EDR and Bluetooth low energy, ZigBee, WiFi, RF transceiver and RF modules. Data enrichment, Data consolidation & device management at gateway.

**UNIT-IV**

**Design principles for web connectivity:** web communication protocols for connected devices, constrained application protocol, CoAP Client web connectivity, client authentication, lightweight M2M communication protocol.

**UNIT-V**

Message communication protocols for connected devices – CoAP-SMS, CoAP-MQ, MQTT, XMPP. IoT privacy, security and vulnerabilities and their solutions.

**Text                                                                                         Books:**
1. ArshdeepBahga, Vijay Madisetti, Cloud Computing – A Hands-on Approach, University Press.
2. RajkumarBuyya, James Broberg, Andrzej Goscinski, Cloud Computing – Principles and Paradigms, Wiley India Pvt. Ltd.
3. Raj Kamal, Internet of Things – Architecture and Design Principles, McGraw Hills

**Reference**                                                                                                       **Books:**

1. Kai Hwang, Geoffrey C.Fox, and Jack J. Dongarra, Distributed and Cloud Computing, Elsevier India Private Limited

2. Saurabh Kumar, Cloud Computing, Wiley India Pvt. Ltd.

3. Shailendra Singh, Cloud Computing, Oxford

4. Coulouris, Dollimore and Kindber, Distributed System: Concept and Design, Addison Wesley

5. Michael Miller, Cloud Computing, Dorling Kindersley India

6. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud computing: A practical Approach, McGraw Hill

7. DimitriosSerpnos, Marilyn Wolf, Internet of Things (IoT) Systems, Architecture, Algorithms, Methodologies, Springer

8. Vijay Madisetti and ArshdeepBahga, Internet of Things (A Hands-on Approach), VPT

9. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications

**IV B.Tech I Semester**

| 23A52701a | **BUSINESS ETHICS AND CORPORATE GOVERNANCE** Management Course- II | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 2 |

| **COURSE OBJECTIVES :**The objectives of this course are | |
|---|---|
| 1 | To make the student understand the principles of business ethics |
| 2 | To enable them in knowing about the ethics in management |
| 3 | To facilitate the student' role in corporate culture |
| 4 | To impart knowledge about the fair-trade practices |
| 5 | To encourage the student in knowing about the corporate governance |

**UNIT-I: Ethics**

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior.. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management -Corporate Social Responsibility – Issues of Management – Crisis Management.

**LEARNING OUTCOMES:-**After completion of this unit student will
  ➢ Understand the  meaning of loyalty and ethical Behavior
  ➢ Explain various types of Ethics
  ➢ Analyze issues & crisis of management

**UNIT-II: ETHICS IN MANAGEMENT**

Introduction-  Ethics in production,  finance,  Human  resource  management  and  Marketing Management - The  Ethical  Value  System  –  Universalism,  Utilitarianism,  Distributive  Justice, Social Contracts,  Individual  Freedom  of  Choice,  Professional  Codes;  Culture  and  Ethics  – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

**LEARNING OUTCOMES:-**After completion of this unit student will
  ➢ Understand the  meaning of Ethics in various areas of management
  ➢ Compare and contrast professional ethics and technical ethics
  ➢ Develop ethical values in self and organization

**UNIT-III : CORPORATE CULTURE**

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared  values,  beliefs  and  norms,  rituals,  symbols  and  language  -  Types  of  corporate  culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

**LEARNING OUTCOMES:-**After completion of this unit student will

➢ Define corporate culture
➢ Understand the  key elements of corporate culture
➢ Analyze organization leadership and corporate culture

## UNIT- IV: LEGAL FRAME WORK

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

**LEARNING OUTCOMES:-**After completion of this unit student will
➢ Understand Law and Ethics
➢ Analyze Different fair trade practices
➢  Make use of Environmental Protection and Fair Trade Practices

## UNIT -V: CORPORATE GOVERNANCE

Introduction  -  Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams  -  Committees  in  India  and  abroad, corporate  social responsibility.  BoDs composition, Cadbury Committee - Various committees  - Reports - Benefits and Limitations.

**LEARNING OUTCOMES:-**After completion of this unit student will
➢ Understand corporate governance code
➢ Analyze role of auditors, board of directors and shareholders in corporate governance
➢ Implementing corporate social responsibility in India.

**Text books.**

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017

2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

**Reference books**

1. Dr. K. Nirmala, KarunakaraReaddy.  *Business Ethics and Corporate Governance*, HPH

2. H.R.Machiraju: *Corporate Governance*, HPH, 2013
3. K. Venkataramana, *Corporate Governance*, SHBP.

 4. N.M.Khandelwal. *Indian Ethos and Values for Managers*

| COURSE OUTCOMES: At the end of the course, students will be able to | | BTL |
|---|---|---|
| CO1 | Understand the Ethics and different types of Ethics. | L2 |
| CO2 | Understand business ethics and ethical practices in management | L2 |
| CO3 | Understand the role of  ethics in management | L2 |
| CO4 | Apply the knowledge of professional ethics & technical ethics | L3 |
| CO5 | Analyze   corporate law, ethics, codes & principles | L4 |
| CO6 | Evaluate corporate governance & corporate scams | L5 |

BTL = Bloom's Taxonomy Level

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117/

**IV B.Tech I Semester**

| 23A52701b | **E-BUSINESS** | **L** | **T** | **P** | **C** |
|-----------|----------------|-------|-------|-------|-------|
|           |                | 2     | 0     | 0     | 2     |

| **Course Objectives: The Objectives of this course are** | |
|---|---|
| 1 | To provide knowledge on emerging concept on E-Business related aspect. |
| 2 | To understand various electronic markets & business models. |
| 3 | To impart the information about electronic payment systems & banking. |
| 4 | To create awareness on security risks and challenges in E-commerce. |
| 5 | To the students aware on different e-marketing channels & strategies. |

**Unit-I: Electronic Business**

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce – E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

**Learning Outcomes: -**After completion of this unit student

➢ Understand the concept of  E-Business
➢ Contrast and compare E-Commerce & E-Business
➢  Evaluate opportunities of E-commerce for industry

**Unit-II: Electronic Markets and Business Models**

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

**Learning Outcomes: -**After completion of this unit student will

➢ Understand the concept of business models
➢ Contrast and compare Vertical portal and Horizontal portals
➢ Analyze the B2B,B2C and B2G model

**Unit-III: Electronic Payment Systems:**

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

**Learning Outcomes: -**After completion of this unit student will

➢ Understand the Electronic payment system
➢ Contrast and compare EFT and smart cards
➢ Analyze debit card and credit cards

**Unit-IV:E-Security**

Security risks and challenges in electronic commerce - Cyber threats -  Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms.

**Learning Outcomes: -**After completion of this unit student will

- ➢ Understand E-Security
- ➢ Contrast and compare security protocols and public network
- ➢ Evaluate  on Digital signature

**Unit-V:E-Marketing:**

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– –   E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

**Learning Outcomes: -**After completion of this unit student will

- ➢ Understand the concept of online marketing
- ➢ Apply the knowledge of online marketing
- ➢ Compare e-CRM and e-SCM

**Text Books:**

1. Arati Oturkar&Sunil Khilari. *E-Business*. Everest Publishing House, 2022
2. P.T.S Joseph. *E-Commerce*, Fourth Edition, Prentice Hall of India, 2011

**References:**

1. Debjani, Kamalesh K Bajaj. *E-Commerce*, Second Edition Tata McGraw-Hill's, 2005

2. Dave Chaffey.*E-Commerce E-Management,* Second Edition, Pearson, 2012.

3. Henry Chan. *E-Commerce Fundamentals and Application,* RaymondLeathamWiley India 2007

4. S. Jaiswal. *E-Commerce* GalgotiaPublication Pvt Ltd., 2003.

| COURSE OUTCOMES: At the end of the course student will be able to | | BTL |
|---|---|---|
| CO1 | Remember E-Business & its nature, scope and functions. | L1 |
| CO2 | Understand E-market-Models which are practicing by the organizations | L2 |
| CO3 | Apply the concepts of  E-Commerce in the present globalized world. | L3 |
| CO4 | Analyze the various E-payment systems & importance of net banking. | L4 |
| CO5 | Evaluate market research strategies & E-advertisements. | L5 |
| CO6 | Understand importance of E-security & control | L2 |

BTL = Bloom's Taxonomy Level

**Online Resources:**

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771

https://www.slideshare.net/VikramNani/e-commerce-business-models

https://www.slideshare.net/RiteshGoyal/electronic-payment-system

https://www.slideshare.net/WelingkarDLP/electronic-security

https://www.slideshare.net/Ankitha2404/emarketing-ppt

**IV B.Tech I Semester**

| 23A52701c | **Management Science** | L | T | P | C |
|-----------|------------------------|---|---|---|---|
|           |                        | 2 | 0 | 0 | 2 |

| **COURSE OBJECTIVES :** The objectives of this course are | |
|---|---|
| 1 | To provide fundamental knowledge on Management, Administration, Organization & its concepts. |
| 2 | To make the students understand the role of management in Production |
| 3 | To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts |
| 4 | To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management |
| 5 | To make the students aware of the contemporary issues in modern management |

## UNIT- IINTRODUCTION TO MANAGEMENT

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

**LEARNING OUTCOMES:** At the end of the Unit, the students will be able to

- ➢ Understand the concept of management and organization
- ➢ Apply the concepts & principles of management in real life industry.
- ➢ Analyze the organization chart & structure of an enterprise.

## UNIT - II  OPERATIONS MANAGEMENT

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- **Material Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

**LEARNING OUTCOMES:** At the end of the Unit, the students will be able to

- ➢ Understand the core concepts of Operations Management
- ➢ Apply the knowledge of Quality Control, Work-study principles in real life industry.
- ➢ Evaluate Materials departments & Determine EOQ
- ➢ Analyze Marketing Mix Strategies for an enterprise.
- ➢ Create and design advertising and sales promotion

## UNIT -  III  HUMAN RESOURCES MANAGEMENT (HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection -  Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

**LEARNING OUTCOMES:** At the end if the Unit, the students will be able to

- Understand the concepts of HRM, Recruitment, Selection, Training & Development
- Analyze the need of training
- Evaluate performance appraisal
- Design the basic structure of salaries and wages

## UNIT - IV STRATEGIC & PROJECT MANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

**LEARNING OUTCOMES:** At the end of the Unit, the students will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise
- Apply SWOT Analysis to strengthen the project
- Analyze Strategy formulation and implementation
- Evaluate PERT and CPM Techniques

## UNIT - V CONTEMPORARY ISSUES IN MANAGEMENT

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management –sustainability and corporate social responsibility.

**LEARNING OUTCOMES** At the end if the Unit, the students will be able to

- Understand modern management techniques
- Apply Knowledge in Understanding in TQM, SCM
- Analyze CRM, BPR
- Evaluate change management & sustainability

**Text Books:**

**1. Frederick S. Hillier, Mark S. Hillier.** *Introduction to Management Science*,
**October 26, 2023**
2. A.R Aryasri, *Management Science*, TMH, 2019

**References:**

1. Stoner, Freeman, Gilbert.*Management*, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N.Duening& John M.Ivancevich, *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, *Modern Management*, 9/e, PHI, 2005

| COURSE OUTCOMES: At the end of the course, students will be able to | | BTL |
|---|---|---|
| CO1 | Remember the concepts & principles of management and designs of organization in a practical world | **L1** |
| CO2 | Understand the knowledge of Work-study principles & Quality Control | **L2** |

| | | |
|---|---|---|
| | techniques in industry | |
| CO3 | Apply the process of Recruitment & Selection in organization. | **L3** |
| CO4 | Analyze the concepts of HRM & different training methods. | **L4** |
| CO5 | Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT. | **L5** |
| CO6 | Create awareness on contemporary issues in modern management & technology. | **L3** |

BTL = Blooms Taxonomy Level

ONLINE RESOUECES:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/
5. https://onlinecourses.nptel.ac.in/noc24_mg112/

**IV B.Tech I Semester**

| 23A35702a | AD-HOC AND SENSOR NETWORKS | L | T | P | C |
|---|---|---|---|---|---|
| | (Professional Elective-IV) | 3 | 0 | 0 | 3 |

**Course objectives:**
- Knowledge about the MANET
- To know the Mobile Network Layers
- To know the application wireless sensors
- Knowledge about security in WSNs
- Knowledge about the Sensor network Platforms and tools

**Course Outcomes:**

- Understand the characteristics, applications, and routing strategies of Mobile Ad Hoc Networks (MANETs), distinguishing between topology-based and position-based approaches.
- Analyze transmission challenges in MANETs including broadcasting, multicasting, geocasting, and evaluate TCP performance and its adaptations for mobile environments.
- Explore the architecture, design challenges, and application areas of Wireless Sensor Networks, including techniques for efficient data retrieval and adaptation.
- Understand key security mechanisms in MANETs and WSNs, including secure routing and IDS, and examine hardware and software platforms for sensor network development.
- Gain knowledge of WSN-specific operating systems and programming tools such as TinyOS, nesC, TinyGALS, and simulation tools like ns-2 and TOSSIM.

**UNIT-1**
Introduction to ad hoc wireless networks: characteristics of MANETs, Application of MANETs, challenges Topology-based versus positions- based approaches, topology based routing protocols, positions  based routing, other routing protocols.

**UNIT-2**
Data Transmission InManets: The broadcast storm multicasting, geo casting Tcp Over Ad Hoc Networks: TCP protocol overview, TCP and MANETs, solutions for TCP over Ad Hoc.

**UNIT-3**
Basics of wireless sensors and applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications. Data retrieval in sensor networks: classification of WSNs, MAC layer routing layer , high level application layer support, adapting to the inherent dynamic nature of WSNs.

**UNIT-4**
Security: security in ad-hoc wireless networks, key management, secure routing cooperation in MANETs, instruction detection system.
Sensor network platforms and tools: Sensor network hardware, sensor network programming challenges, Node-Level software Platforms

**UNIT-5**
Operating system- Tiny OS Imperative language: nesC,
Dataflow style language: Tiny GALS, Node-level Simulators, ns-2 and its sensor networks extension, TOSSIM.

**TEXT BOOKS**
T1. Ad Hoc and sensor networks, Carlos Corderio Dharma P.Aggarwal, world scientific publication/ Cambridge university press, March 2006

T2. Wireless sensor networks: An information processing approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman publishers, 2005,rp2009

**REFERENCE BOOKS**

R1. Ad hoc Wireless Networks- Architecture and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education

R2. Wireless sensor networks-Principles and Practice, FeiHu, Xiaojun Cao, An Auerbach book CRC press.

R3 Wireless Ad Hoc Mobile wireless Networks- principle, protocols and applications, Subir Kumar Sarkar , et al.,Auerbach publications, Taylor & Francis Group,2008

R4. Ad Hoc networking, Charles E.Perkins, Pearson Education,2011.

R5.wireless Ad Hoc Networking , Shih-LinWu, Yu-Chee Tseng, Auerbach publications, Taylor & Francis group, 2007.

R6. Wireless Ad Hoc and sensor networks-Protocols, Performance and Control, JagnnathanSarangapani, CRC press, Taylor & Francis group, 2007

R7. Security Ad Hoc and sensor networks, Raheem Beyah, et al World Scentific Publications/ Cambridge University Press, 2010

R8. Ad hoc Wireless Networks –A communication –theoretic perspective, OzanK.Tonguz, GialuigiFerrari,Wiley India

R9. Wireless Sensor Networks –Signal Processing and communication perspectives, Ananthram Swami, Wiley India

WEBSITES
1. www.cs.princeton.edu
2. http://sureshq.blogspot.in/2016/12/wireless-sensors-networks-wsn-notes-and.html
3. www.cs.ucl.ac.uk
4. www.comp.nus.edu.sg
5. www.iitk.ac.in
6. www.iitd.ernet.in
7. www.iitr.ac.in
8. www.iitg.ernet.in
9. www.bits-pilani.ac.in
10. www.iisc.ernet.in

**IV B.Tech I Semester**

| 23A35702b | **MALWARE ANALYSIS & REVERSE ENGINEERING** (Professional Elective-IV) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To understand different types of malware and their behaviors.
- To analyze malware using static and dynamic techniques.
- To learn reverse engineering fundamentals and binary analysis.
- To use industry-standard tools for malware analysis and debugging.
- To develop countermeasures against modern malware threats.

**Course Outcomes (COs):**

After completing this course, students will be able to:

- Identify and classify different types of malware.
- Perform static and dynamic analysis using specialized tools.
- Reverse engineer binaries to understand their execution logic.
- Apply anti-analysis and deobfuscation techniques for malware analysis.
- Develop and implement effective malware defense strategies

**UNIT 1: Introduction to Malware and Threat Landscape**

Overview of Cyber Threats and Malware - Types of Malware: Viruses, Worms, Trojans, Ransomware, Rootkits, Spyware, Botnets - Infection Vectors andAttack Mechanisms - Malware Lifecycle and Behavior- Case Studies of Notorious Malware (WannaCry, Stuxnet, Zeus, Mirai)

**UNIT 2: Malware Analysis Techniques**

Malware Analysis Environment Setup (Virtual Machines, Sandboxing)-Static Analysis: File Signatures and PE Headers-String Extraction and Hashing-Signature-Based Detection Dynamic Analysis: Process Monitoring and Behavioural Analysis- API Calls and Network Traffic Analysis-Sandboxing with Cuckoo.

**UNIT 3: Reverse Engineering Fundamentals**

Introduction to Disassembly and Debugging- Assembly Language Basics for Reverse Engineering-Understanding Executable File Formats (PE, ELF)- Introduction to Reverse Engineering Tools: IDA Pro, Ghidra, OllyDbg, x64dbg-Debugging and Binary Analysis Techniques.

**UNIT 4: Advanced Malware Analysis & Reverse Engineering**

Code Obfuscation and Anti-Reverse Engineering Techniques - Unpacking and Decrypting Malware - API Hooking and Process Injection- Shellcode Analysis and Exploit Techniques-Memory Forensics for Malware Investigation.

**UNIT 5: Malware Defense, Detection, and Case Studies**

Signature-Based vs. Behavior-Based Detection - Machine Learning for Malware Detection- Evasion Techniques Used by Modern Malware- Incident Response and Forensic Analysis-Case Study: Analyzing a Real-World Malware Sample.

**Textbooks:**

**Malware Analysis:** Michael Sikorski & Andrew Honig, *Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software*, No Starch Press, 2012.

1. **Reverse Engineering:** Bruce Dang, Alexandre Gazet, Elias Bachaalany, *Practical Reverse Engineering: x86, x64, ARM, Windows Kernel, Reversing Tools, and Obfuscation*, Wiley, 2014.

   **Reference Books:**

1. Chris Eagle, *The IDA Pro Book: The Unofficial Guide to the World's Most Popular Disassembler*, No Starch Press, 2011.

2. Cameron Malin, Eoghan Casey, James Aquilina, *Malware Forensics: Investigating and Analyzing Malicious Code*, Syngress, 2008.

**IV B.Tech I Semester**

| 23A35702c | **CRYPTO CURRENCY** **Professional Elective-IV** | L | T | P | Credits |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

• To understand the importance of digital money through crypto mechanisms

• To be able to explain the different components involved within Blockchain

• To understand how the blockchain creates economic incentives

• To know the system works and how can they utilize and what application can be build using crypto currency .

**COURSE OUTCOMES**

• CO1- Understand emerging abstract models for Blockchain Technology

• CO2- Familiarise the functional/operational aspects of cryptocurrency ecosystem

• CO3- Familiarize with Ethereum, smart contracts and related technologies, and solidity language

• CO4- Demonstrate how cryptographic primitives can be leveraged to construct secure electronic currencies like Bitcoin

• CO5- Enumerate the Bitcoin features and its lternative options CO6- Build their own application using the learned concepts.

**UNIT - 1   DIGITAL MONEY AND CRYPTOGRAPHY**

Physical Money and Digital Money - History of Money: Forms of Money, Fiat Currencies, Currency Pages, Quantitative Easing - Interbank Payment Mode: Same Bank, Different Bank, Correspondent Bank, Central Bank, International Payment, Cryptography: Encryption and Decryption, Hashed, Digital Signature.

**UNIT- 2 CRYPTOGRAPHY AND BLOCKCHAIN TECHNOLOGY**

Cryptography: Hash function - Digital Signature - ECDSA - Memory Hard Algorithm - Zero Knowledge Proof. Blockchain: Introduction - Advantage over conventional distributed database – Blockchain Network - Mining Mechanism - Distributed Consensus - Merkle Patricia Tree - Gas Limit - Transactions and Fee - Anonymity - Reward - Chain

**UNIT - 3 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLGOY**

Introduction to crypto and crypto currency - Primitives of crypto - Bitcoin - Point of Bitcoin - Working of Bitcoin - Bitcoin in practice - Bitcoin Predecessor - Bitcoin Decentralization - Store and use of Bitcoin - Bitcoin Mining - Ethereum: Ethereum Ecosystem - Case Study: Bitcoin cash.

**UNIT-4   ETHEREUM AND SOLIDITY**

Alternative approaches to mining and consensus - Bitcoin and anonymity - Overview of Altcoins - Overview of Ethereum - Programming smart contracts on Ethereum - Solidity Language –

Cryptocurrencies & the real world: Smart property, data feeds, and public randomness - Applications of cryptocurrencies and blockchains.

**UNIT-5 CRYPTO CURRENCY REGULATION AND BLOCKCHAIN APPLICATIONS**

Cryptocurrency Regulation: Stakeholders - Roots of Bitcoin - Legal Aspects – Cryptocurrency Exchange - Black Market and Global Economy. Blockchain Applications: Internet of Things - Medical Record Management System - Domain Name Service - future of Blockchain.

**TEXT /REFERENCE BOOKS**

1.Antony Lewis, "The Basics of Bitcoin and Blockchains: An Introduction to Cryptocurrencies and Technology that powers them" 2018

2.Wiley, "Cryptocurrencies and Blockchain Technology Applications", Wiley 2020

3.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press (July 19, 2016).

4.Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies", O'Reilly (2014)

5.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016

**IV B.Tech I Semester**

| 23A05602b | **DevOps** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | **(Professional Elective-IV)** | **3** | **0** | **0** | **3** |

**Pre-requisite**:
Fundamentals of software development and maintenance

**Course Objectives:**
• Understand collaboration and productivity by automating infrastructure and workflows
• Familiarize with continuous measuring applications performance

**Course Outcomes:** After completion of the course, students will be able to
• Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
• Describe Dev Ops &Dev Sec Ops methodologies and their key concepts
• Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
• Set up complete private infrastructure using version control systems and CI/CD tools

**UNIT-I**                                                                  Lecture    8 Hrs
**Dev Ops:** An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices Dev Ops: Culture.
**Adopting Dev Ops:** Developing the Playbook. Developing a Business Case for a Dev Ops: Developing the Business Case
**UNIT-II**                                                                 Lecture    9 Hrs
Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays
**UNIT-III**                                                                Lecture    8 Hrs
**Dev Ops Plays for Driving Innovation:** Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Microservices Architectures, play: DevOps an API Economy, play: Organizing for Innovation.
**UNIT-IV**                                                                 Lecture    10 Hrs
**Scaling Dev Ops for the Enterprise:** Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.
**UNIT-V**                                                                  Lecture    10 Hrs
**Leading Dev Ops Adoption in the Enterprise:** Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example Dev Ops Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.

**Textbooks:**
1. Sanjeev Sharma, The DevOps Adoption Playbook, Published by John Wiley & Sons, Inc.2017

**Reference Books:**

1. Sanjeev Sharma & Bernie Coyne, DevOps for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Huttermann, DevOps for Developers, Apress publishers,2012.

**Online Learning Resources:**
Learning DevOps with Terraform Infrastructure Automation Course | Udemy

**IV B.Tech I Semester**

| 23A35703a | **CYBER LAWS AND SECURITY POLICIES** | L | T | P | C |
|-----------|--------------------------------------|---|---|---|---|
|           |                                      | 3 | 0 | 0 | 3 |

**Course Objectives:**
- Gain an understanding of the evolution and jurisprudence of cyber law in India, including the IT Act 2000.
- Learn about digital signatures, e-governance, and their legal implications under the IT Act.
- Understand the legal framework for electronic contracts, their formation, and international perspectives.
- Explore taxation issues in cyberspace, cybercrimes, electronic evidence, and their adjudication under the IT Act.

**Course Outcomes**
- Learn evolution and key aspects of Indian cyber law, including recent amendments.
- Gain knowledge about the legalities of digital signatures and the role of e-governance in the IT Act.
- Develop an understanding of the legalities involved in electronic contracts and international conventions.
- Adapt in understanding and analyzing cybercrime, electronic evidence, and intellectual property rights in the context of IT.

**UNIT - I**

**Introduction:** History of Internet and World Wide Web, Need for cyber law, Cybercrime on the rise, Important terms related to cyber law.

**Cyber law in India:** Need for cyber law in India, History of cyber law in India.

**Information Technology Act, 2000:** Overview of other laws amended by the IT Act, 2000, National Policy on Information Technology 2012.

**UNIT - II**

**Overview of the Information Technology Act, 2000:** Applicability of the Act, Important provisions of the Act: Digital signature and Electronic signature, Digital Signature under the IT Act, 2000, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries.

**UNIT - III**

Overview of rules issued under The IT Act, 2000, Electronic Commerce, Electronic Contracts, CyberCrimes, Cyber Frauds.

**UNIT - IV**

**Regulatory Authorities:**Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribunal, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

**UNIT - V**

**Introduction to Cybercrime and procedure to report Cyber crime:**procedure to report cybercrime, some basic rules for safe operations of the computer and internet, the criminal law (amendment) act, 2013: legislative remedies for online harassment and cyberstalking in India.

**TEXT BOOKS:**

1. Text book on "Cyber Law", **2 Ed Rp 2023**, Pavan Duggal, Universal Law Publishing.

2. Text book on "Indian Cyber law on Cybercrimes", Pavan Duggal,

**REFERENCE BOOKS:**

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.

2. Thomas R. Peltier, "Information Security policies and procedures: A

Practitioner's Reference", $2^{nd}$ Edition Prentice Hall, 2004.

3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.

4. Thomas R Peltier, Justin Peltier and John Blackley," Information Security Fundamentals", $2^{nd}$ Edition, Prentice Hall, 1996.

**IV B.Tech I Semester**

| 23A35703b | **INTRUSION DETECTION AND PREVENTION SYSTEM** <br> **(Professional Elective-V)** | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:**
1. Comprehend the historical evolution and key concepts of intrusion detection and audit techniques.
2. Gain skills to effectively use various IDS and IPS technologies, including hybrid approaches.
3. Develop the ability to independently install, configure, and use Snort in diverse scenarios.
4. Foster analytical skills for intrusion detection, encompassing vulnerability analysis and response strategy formulation.
5. Explore advanced techniques, including ACID and Snort Snarf, and understand different IDS and IPS architecture models.

**Course Outcomes:**
1. Articulate the historical evolution of intrusion detection, define key concepts, and understand cybersecurity importance.
2. Demonstrate proficiency in deploying various IDS and IPS technologies, informed by threat assessments.
3. Install, configure, and use Snort for intrusion detection across multiple network interfaces.
4. Ability to analyze intrusions, conduct vulnerability assessments, and formulate responses aligned with security policies.
5. Apply advanced techniques, including ACID and Snort Snarf, and develop custom agents for tailored intrusion detection solutions. Understand different architecture models of IDS and IPS.

**UNIT-I                                                                                           9 Hrs**

History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.

**UNIT-II                    9Hrs**

Intrusion Prevention Systems, Network IDs, protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis techniques, Responses requirement of responses, types of responses mapping, responses to policy Vulnerability analysis, credential analysis, non credential analysis.

**UNIT-III                                                                                         9 Hrs**

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-
By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes

**UNIT-IV                                                                                          9 Hrs**

Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL

**UNIT-V                                                                                            9 Hrs**

Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.

**TEXT BOOKS:**

1. RafeeqRehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and  ACID," 1st Edition, Prentice Hall , 2003.

**REFERENCES:**

1. Christopher Kruegel,FredrikValeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander" Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.
4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

**IV B.Tech I Semester**

| 23A05702b | METAVERSE | L | T | P | C |
|-----------|-----------|---|---|---|---|
|           | (Professional Elective-V) | 3 | 0 | 0 | 3 |

**Course Objectives:**
The main objectives of the course are to:
1. Present and discuss Metaverse characteristics, concepts and layers.
2. Explain and analyse Metaverse technologies, tools, platforms, and applications.
3. Discuss design theories and practices relevant to the Metaverse.
4. Explore cybersecurity and cybercrime in the Metaverse.
5. Examine open challenges in the Metaverse.

**Learning Outcomes:** After completion of the course students are expected to be able to:
1. Understand the characteristics, and interdisciplinary nature of the Metaverse, the opportunities and risks it presents.
2. Analyze Metaverse layers, the technologies used in creating them, as well as design theories and practices for Metaverse.
3. Examine and discuss Metaverse platforms, applications and the latest technological developments in this area.
4. Identify cyber security issues, understand cybercrime, and discuss the open challenges.
5. Building Metaverse Applications

**Unit-1**
Metaverse fundamentals: Metaverse evolution, Metaverse importance and characteristics, the interdisciplinary nature of the Metaverse, Metaverse opportunities and risks, Computer-mediated communication (social presence theory, social information processing theory, media richness theory, cyborg theory), Avatar-mediated communication.

**Unit-2**
The seven layers of Metaverse: Experience
Discovery, Creator economy, Spatial computing, Decentralization, Human interface, Infrastructure
Metaverse Technologies part I: AR/VR/MR/XR, 3D reconstruction, Game engines, Smart glasses, wearables, haptic devices, headsets and headwear.

**Unit-3**
Metaverse technologies part II: Blockchain, smart contracts, tokens, NFTs, Cryptography, Artificial Intelligence (AI), Internet of Things (IoT), Edge computing and 5G, 6G. Design theories and practices: Social presence and co-presence, Motion sickness and cybersickness, Uncanny valley, Sense of self-location, sense of agency and sense of body ownership, Universal simulation principle, Prototyping, Evaluation techniques (qualitative and quantitative

**Unit-4**
Tools and technologies for Metaverse UX and UI: Tools and services for avatar systems, Spatial user interface design, Cross-platform user experience design, Multimodal user interface, Technologies and devices for human computer interaction in Metaverse, Metaverse platforms: Decentraland, SANDBOX, Roblox, Axie Infinity, uHive, Hyper Nation, Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS), Bloktopia (BLOK), Stageverse, Spatial, PalkaCity, Viverse, Sorare, Illuvium, Upland, Second Life, Sansar, Sensorium Galaxy

**Unit-5**
Metaverse applications - part I: Gaming and entertainment, Travel and tourism, Education and learning, Remote working, Commerce and business, Metaverse applications - part II: Real estate, Banking and Finance, Healthcare, Social media, Fashion, Metaverse and cybersecurity: Cybersecurity concerns in Metaverse: Social engineering attacks, Data theft, Decentralization vs vulnerabilities, Cybersecurity risks in Metaverse: process, people, technology, Metaverse and cybercrime: Scam and theft, Rug pull, Money manipulation and wash trading, Money laundering, Metaverse challenges and

open issues: Persistency, Interoperability and scalability, Maturity, Regulation, Usefulness and ease-of-use, Privacy and data security, Content creation, NFTs and creator economy, Social, legal and ethical issues in the Metaverse

**Textbooks**
The Metaverse, Terry Winters, Independently published, 2021, ISBN: 979-8450959283

**Reference Books:**
1. Ball, M., 2022, "The Metaverse and How It Will Revolutionize Everything", Liveright, ISBN: 978-1324092032
2. Damar, M. (2021). Metaverse shape of your life for future: A bibliometric snapshot. Journal of Metaverse, 1(1), 1–8.
3. Day, J. (2022) Metaverse will see cyberwarfare attacks unlike anything beforeMassivelyelevated',February28, https://www.express.co.uk/news/science/1570844/metaverse-news-cyber-

warfare-attacks-virtual-worlds-russia-china-spt.
4. Polyviou, A., Sharma K., Pappas, I.O.(2023). Training in the metaverse: Employing physiological data to improve how we build metaverses for businesses. The next generation internet: The role of metaverses, AR, VR, MR, and digital twins, Temple University Institute for Business andInformation Technology
Link: https://ibit.temple.edu/nextgenerationinternet
5. QuHarrisonT. , Keeney, S., 2022, "The Metaverse Handbook: Innovating for the Internet's Next Tectonic Shift", Wiley, ISBN: 978-1119892526
6. Themistocleous, M., Christodoulou, K., &Katelaris, L. (2023). An Educational Metaverse Experiment: The first on-chain and in-Metaverse academic course. Information Systems. EMCIS 2022. Lecture Notes in Business Information Processing, Springer, Cham.
7. Stephenson, N., 1992, "Snow Crash", ISBN: 978-055338

**IV  B.Tech – I Semester**

| 23A05701c | **AUGMENTED REALITY AND VIRTUAL REALITY** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | **3** |

**Course Objectives:**

The primary objective of this course is to introduce students to the foundational principles and technologies of Virtual Reality (VR) and Augmented Reality (AR), along with the key devices, modeling techniques, and interaction mechanisms involved in creating immersive environments. The course will cover the essentials of VR and AR, including hardware, software, and human perception, as well as advanced concepts such as 3D modeling, interaction design, and audio rendering. Students will gain hands-on experience in the use of VR/AR systems and explore the challenges and methodologies for building interactive virtual environments.

**Course Outcomes:** At the end of the Course the student will be able to:
1. Understand the core concepts of Virtual Reality and Augmented Reality, and their differences.
2. Learn about the hardware and software components required for VR and AR systems, as well as the impact of human physiology and perception on the virtual experience.
3. Gain knowledge of input devices (trackers, navigation, and gesture interfaces) and output devices (graphics, sound displays, and haptic feedback).
4. Develop skills in modeling techniques, including geometric, kinematics, physical, and behavior modeling for VR and AR environments.
5. Explore the technologies and methodologies used to create Augmented Reality systems, including marker-based AR and AR software development.

**UNIT - I**                                                          (10 Lectures)

**INTRODUCTION TO VIRTUAL REALITY (VR):** Defining Virtual Reality, Key elements of virtual reality experience, Virtual Reality, Telepresence, Augmented Reality and Cyberspace.

**Bird's-Eye View:** Hardware, Software, Human Physiology and Perception.

**UNIT-II**                                                          (10 Lectures)

**Input Devices: (Trackers, Navigation, and Gesture Interfaces):** Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces**.**

**Output Devices:** Graphics displays, sound displays & haptic feedback.

**UNIT-III**                                                          (10 Lectures)

**Modeling:** Geometric modeling, Kinematics modeling, Physical modeling, Behaviour modeling, Model management.

**UNIT-IV**                                                          (10 Lectures)

**Augmented Reality (AR):** Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating AR systems.

**AR software development :**AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.

**UNIT-V**          **(10 Lectures)**
**Interaction & Audio:**

Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction.

Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception,

Auditory Rendering. (from Text Book2)

**TEXT BOOKS:**
1. Virtual Reality Technology, Second Edition, Gregory C. Burdea& Philippe Coiffet, John Wiley & Sons, Inc, 2017.
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

**REFERENCES:**
1. RajeshK.Maurya,*Computer Graphics with Virtual Reality System*, 3rd Edition, Wiley Publication, 2018.

2. William R. Sherman and Alan B. Craig, *Understanding Virtual Reality Interface, Application, and Design*, 2nd Edition, Morgan Kaufmann Publishers, Elsevier, 2019.

3. GrigoreC.Burdea,PhilippeCoiffet,*Virtual Reality Technology*, 2nd Edition, Wiley,2017.

4. K.S. Hale and K. M. Stanney, *Handbook on Virtual Environments*, 2nd Edition, CRC Press, 2015.

**WEB REFERENCES:**
1. http://vr.cs.uiuc.edu/vrbook.pdf
2. https://nptel.ac.in/courses/106/106/106106138/

**IV B.Tech I Semester**

| 23A35704 | ETHICAL HACKING | L | T | P | C |
|---|---|---|---|---|---|
| | (Skill Enhancement Course) | 0 | 1 | 2 | 2 |

**Course Objectives:**
The objective of this course is to make students to,
1. To learn about the importance of information security.
2. To learn different scanning and enumeration methodologies and tools.
3. To understand various hacking techniques and attacks.
4. To be exposed to programming languages for security professionals.
5. To get familiarized with the different phases in penetration testing.

**Course Outcomes:**
Upon completion of this course, the student should be able to,
1. Understand how to secure the information.
2. Defend hacking attacks and protect data assets.
3. Defend a computer against a variety of security attacks using various tools.
4. Practice and use safe techniques on the World Wide Web.
5. Get familiarized with the different phases in penetration testing.

**UNIT-I**                                                                       **9 Hrs**
**Introduction to Hacking**: Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines.
   a) Write a Python program to perform a WHOIS lookup on a domain.
   b) Write a Python program to extract DNS records (A, MX, NS) for a given domain.
   c) Write a Python script to scan open ports on a target machine using the socket module.
   d) Write a program to implement a basic keylogger for ethical testing (Ensure responsible use).
   e) Write a Python program to identify hidden files in a given directory

**UNIT-II**                                                                      **9 Hrs**
Scanning and Enumeration: Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools.

   a) Write a Python program to perform a basic network scan using the socket module.
   b) Write a Python script to scan open ports on a target IP using nmap (requires python-nmap library).
   c) Write a Python program to identify live hosts in a network using ICMP (Ping Sweep).
   d) Write a Python program to extract system and network details using OS commands (e.g., ipconfig, ifconfig).
   e) Write a Python script to enumerate user accounts and shared resources on a remote system using SMB (requires impacket library).

**UNIT-III**                                                                     **9 Hrs**
System Hacking: Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing – Password Cracking Tools – Password Cracking Counter measures – Escalating Privileges –Executing Applications –Keyloggers and Spyware.
   a) Write a Python program to generate a list of common password combinations for brute-force attacks.
   b) Write a Python script to perform a dictionary-based password attack on a hashed password file.
   c) Write a Python program to implement a basic keylogger to record keystrokes (for ethical testing only).
   d) Write a Python script to detect running keyloggers or spyware processes on a system.

e) Write a Python program to encrypt and decrypt passwords using a hashing algorithm (e.g., SHA-256).

**UNIT-IV** **9 Hrs**
**Programming for Security Professionals:** Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures.

a) Write a Python script to detect buffer overflow vulnerabilities by monitoring input size.
b) Write a Python script to check an HTML file for XSS (Cross-Site Scripting) vulnerabilities using regex.
c) Write a Python script to analyze system logs and detect multiple failed login attempts (brute force detection).
d) Write a Python program to scan a Windows system for open ports and weak password policies.
e) Write a Python script to list all SUID/SGID files on a Linux system that may pose security risks.

**UNIT-V** **9 Hrs**
**Penetration Testing:** Introduction – Security Assessments – Types of Penetration Testing- Phases of Penetration Testing – Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools.

a) Write a Python script to perform an automated vulnerability scan using nmap (requires python-nmap library).
b) Write a Python script to perform banner grabbing to detect service versions running on open ports.
c) Write a Python program to perform a brute-force attack on an SSH server using a wordlist (ethical testing only).
d) Write a Python script to detect and analyze network packets using scapy for penetration testing.
e) Write a Python program to automate SQL Injection detection on a website using requests and BeautifulSoup.

**Text Books:**
1. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning, 2009.
2. Michael T. Simpson, Kent Backman, James E. Corley, "Hands-On Ethical Hacking and  Network Defense", Cengage Learning, 2012.

**Reference Books:**
1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy", Syngress Media, Second Revised Edition, 2013.
2. Jon Erickson, "Hacking: The Art of Exploitation", No Starch Press, Second Edition,  2008.
3. Daniel G. Graham, Ethical Hacking: A Hands-on Introduction to Breaking In, William  Pollock, 2021.

| 23A52702 | GENDER SENSITIZATION | L | T | P | C |
|---|---|---|---|---|---|
| | | **2** | **0** | **0** | **-** |

Course Objectives:

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Course Outcomes (CO):

| COs | Statements | Blooms level |
|---|---|---|
| **CO1** | Understand the basic concepts of gender and its related terminology | L1, L2, |
| **CO2** | Identify the biological, sociological, psychological and legal aspects of gender. | L1, L2 |
| **CO3** | Use the knowledge in understanding how gender discrimination works in our society and how to counter it. | L3 |
| **CO4** | Analyzethe gendered division of labour and its relation to politics and economics. | L4 |
| **CO5** | Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups | L5 |
| **CO6** | Develop students' sensibility with regard to issues of gender in contemporary India | L3 |

### Unit-1UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

### Unit-2GENDER ROLES AND RELATIONS
Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

### Unit-3GENDER AND LABOUR
Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

## Unit-4 GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

## Unit-5 GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Just Relationships

### Prescribed Books

1. A.Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender*", Telugu Akademi, Telangana, 2015.
2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity.* UK Paperback Edn. March 1990

### Reference Books

1. Wtatt, Robin and Massood, Nazia, *Broken Mirrors: The dowry Problems in India,* London : Sage Publications, 2011

2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment,* London: Lynne Rienner Publishers, 2002

3. Brush, Lisa D., *Gender and Governance*, New Delhi, Rawat Publication, 2007

4. Singh, Direeti, *Women and Politics World Wide*, New Delhi, Axis Publications, 2010

5. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges* (English, Hardcover), Raj Publications, 2019

6. A.Revathy& Murali, Nandini, *A Life in Trans Activism*(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. Understanding Gender

chrome-extension://kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf

https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

2. Gender Roles and Relations

https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes

https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408

https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

### 3. Gender and Labour

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed

https://onlinecourses.nptel.ac.in/noc23_mg67/preview

### 4. **GENDER-BASED VIOLENCE**
https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls

https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

### 5. **GENDER AND CULTURE**
https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/

https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/

https://archive.nptel.ac.in/courses/109/106/109106136/

Abdulali Sohaila. "I Fought For My Life…and Won."Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

# OPEN ELECTIVES

**III B.Tech  I Semester**

| Course Code | GREEN BUILDINGS | L | T | P | C |
|---|---|---|---|---|---|
| **23A01505a** | **(OPEN ELECTIVE - I)** | 3 | 0 | 0 | 3 |

**Course Objectives :**
**The objectives of this course are to make the student:**
1. **To understand** the fundamental concepts of green buildings, their necessity, and sustainable features.
2. **To analyze** green building concepts, rating systems, and their benefits in  India.
3. **To apply** green building design principles, energy efficiency measures, and renewable energy sources.
4. **To evaluate** air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.
5. **To assess** material conservation strategies, waste management, and indoor environmental quality in  green buildings.

**Course Outcomes (COs)**
**Upon successful completion of the course, students will be able to:**
1. **Understand** the importance of green buildings, their necessity, and sustainable features.
2. **Analyze** various green building practices, rating systems, and their impact on environmental sustainability.
3. **Apply** principles of green building design to enhance energy efficiency and incorporate renewable energy sources.
4. **Evaluate** HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.
5. **Assess** material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.

CO  - PO Articulation Matrix

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | - | 2 | 3 | - | - | - | - | - | 3 | 3 |
| **CO -2** | - | 3 | - | - | 2 | - | 3 | - | - | - | - | 2 | 3 | 3 |
| **CO -3** | - | - | 3 | 3 | 3 | - | 3 | - | - | - | - | - | 3 | 3 |
| **CO -4** | - | - | 3 | 3 | 3 | - | 3 | - | - | - | - | - | 3 | 3 |
| **CO -5** | - | - | - | - | - | 3 | 3 | 3 | 2 | - | - | - | - | 3 |

| **UNIT – I** | | |
|---|---|---|

Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in  India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.

| **UNIT – II** | | |
|---|---|---|

Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving

Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

**UNIT – III**

Green Building Design– Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

**UNIT – IV**

Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

**UNIT – V**

Material Conservation– Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

**TEXT BOOKS:**
1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by tom woolley and Sam kimings, 2009.

**REFRENCE BOOKS:**
1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code –ECBC-2020, published by BEE

**Online Learning Resources:**
**https://archive.nptel.ac.in/courses/105/102/105102195/**

**III B.Tech – I Semester**

| Course Code | CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE – I) | L | T | P | C |
|---|---|---|---|---|---|
| **23A01505b** | | 3 | 0 | 0 | 3 |

Course Objectives:

**The objectives of this course are to make the student :**
1. To understand project management fundamentals, organizational structures, and leadership principles in construction.
2. To analyze manpower planning, equipment management, and cost estimation in civil engineering projects.
3. To apply planning, scheduling, and project management techniques such as CPM and PERT.
4. To evaluate various contract types, contract formation, and legal aspectsin construction management.
5. To assess safety management practices, accident prevention strategies, and quality management systemsin construction.

Course Outcomes  (COs):

**Upon successful completion of the course, students will be able to:**
1. Understand (Cos)project management fundamentals, organizational structures, and leadership principles in  construction.
2. Analyze manpower planning, equipment management, and cost estimationin  civil engineering projects.
3. Apply planning, scheduling, and project management techniques such as CPM and PERT.
4. Evaluate various contract types, contract formation, and legal aspectsin  construction management.
5. Assess safety management practices, accident prevention strategies, and quality management systems in construction.

**CO – PO Articulation Matrix**

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | - | 2 | - | 2 | 2 | - | - | - | 3 | 3 |
| **CO -2** | - | 3 | - | - | 2 | - | - | - | - | - | - | 2 | 3 | 3 |
| **CO -3** | - | - | 3 | 3 | 3 | - | - | - | - | 2 | - | - | 3 | 3 |
| **CO -4** | - | - | 3 | 3 | 3 | - | - | 2 | - | - | - | - | 3 | 3 |
| **CO -5** | - | - | - | - | - | 3 | 3 | 3 | 2 | - | - | - | - | 3 |

| **UNIT – I** | | |
|---|---|---|

Introduction: Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

| **UNIT – II** | | |
|---|---|---|

Man and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

| | | |
|---|---|---|
| **UNIT – III** | | |
| Planning, Scheduling andProject Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network-formulation and Time Computation. | | |
| **UNIT – IV** | | |
| Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract forLabour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control. | | |
| **UNIT – V** | | |
| Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics. | | |

**TEXT BOOKS:**

1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.

**REFRENCE BOOKS:**

1. Brien, J.O. andPlotnick, F.L., CPMin Construction Management, Mcgraw Hill, 2010.
2. Punmia, B.C., andKhandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management andOrganisational Behaviour, Wiley-Blackwell, 2016.

**Online Learning Resources:**
**https://archive.nptel.ac.in/courses/105/104/105104161/**
**https://archive.nptel.ac.in/courses/105/103/105103093/**

**III B.Tech I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### 23AA0505        ELECTRICAL SAFETY PRACTICES AND STANDARDS
#### (Open Elective-I)

**Course Outcomes:**

**CO1:** Understanding the Fundamentals of Electrical Safety -L2
**CO2:** Identifying and Applying Safety Components -L3
**CO3:** Analyzing Grounding Practices and Electrical Bonding
**CO4:** Applying Safety Practices in Electrical Installations and Environments- L4
**CO5:** Evaluating Electrical Safety Standards and Regulatory Compliance -L5

### UNIT I  IntroductionToElectricalSafety:
Fundamentals ofElectricalsafety-ElectricShock-physiologicaleffects of electric current-Safetyrequirements–Hazardsofelectricity-Arc-Blast-Causesforelectricalfailure.

### UNIT II  Safety Components:
Introduction to conductors and insulators- voltage classification -safety against over voltages-        safety        againststaticelectricity-Electricalsafetyequipment's-Fireextinguishersforelectricalsafety.

### UNIT III Grounding:
General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding -The Earth-Earthingpractices-Determiningsafeapproachdistance-Determiningarchazardcategory.

### UNIT IVSafetyPractices:
Generalfirstaid-Safetyinhandlinghandheldelectricalappliancestools-Electricalsafetyintrain                                                stations-swimmingpools,externallightinginstallations,medicallocations-Casestudies.

### UNIT V Standards For Electrical Safety:
Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electricalinspectorate

TEXTBOOKS:
1. MassimoA.G.Mitolo,"ElectricalSafetyofLow-VoltageSystems",McGrawHill,USA,2009.
2. MohamedEl-Sharkawi,"ElectricSafety-PracticeandStandards",CRCPress,USA,2014

REFERENCES:
1. KennethG.Mastrullo,          RayA.Jones,"TheElectricalSafetyProgramBook",Jones andBartlettPublishers,London, 2nd Edition, 2011.
2. PalmerHickman,"ElectricalSafety-RelatedWorkPractices",Jones&BartlettPublishers,London,2009.
3. FordhamCooper,W.,"ElectricalSafetyEngineering",ButterworthandCompany,London,1986.
4. JohnCadick,MaryCapelli-Schellpfeffer,DennisK.Neitzel,"ElectricalSafetyHandbook,McGraw-Hill,NewYork,USA, 4th edition, 2012.

**III B.Tech – I Sem**                                               **L   T   P   C**
                                                                     **3   0   0   3**

### 23A03505    SUSTAINBLE ENERGY TECHNOLOGIES
#### (Open Elective-I)

| Course objectives: Theobjectives of the courseareto | |
|---|---|
| 1 | To demonstrate the importance the impact of solar radiation, solar  PVmodules |
| 2 | To understand the principles of storage in PV systems |
| 3 | To discuss solar energy storage systems and their applications. |
| 4 | To get knowledge in wind energy and bio-mass |
| 5 | To gain insights in geothermal energy, ocean energy and fuel cells. |

| COURSE OUTCOMES On successful completion of this course the student will be able to | | |
|---|---|---|
| CO1 | Illustrate the importance of solar radiation and solar PV modules. | L1, L2 |
| CO2 | Discuss the storage methods in PV systems | L2,L3 |
| CO3 | Explain the solar energy storage for different applications | L2,L3 |
| CO4 | Understand the  principles of wind energy, and bio-mass energy. | L2, L3 |
| CO5 | Attain knowledge in geothermal energy, ocean energy and fuel cells. | L1, L2,L3, L4 |

## UNIT – 1

**SOLAR RADIATION**: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

**SOLAR PV MODULES AND PV SYSTEMS:**

PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

## UNIT – 2

**STORAGE IN PV SYSTEMS:**

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

## UNIT – 3

**SOLAR ENERGY COLLECTION**: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

**SOLAR ENERGY STORAGE AND APPLICATIONS**: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

## UNIT – 4

**WIND ENERGY**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

**BIO-MASS**: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

## UNIT – 5

**GEOTHERMAL ENERGY:** Origin, Applications, Types of Geothermal Resources, Relative Merits

**OCEAN ENERGY:** Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges

**FUEL CELLS:** Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

**Text Books:**

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH

2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

**References:**

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis

2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd

3. Renewable Energy Technologies -Ramesh & Kumar /Narosa

4. Non-conventional Energy Source- G.D Roy/Standard Publishers

**Online Learning Resources:**

**https://nptel.ac.in/courses/112106318**
https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13
https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3
 https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF

**III B.Tech I Sem**                                      **L – T – P – C**
                                                         **3 – 0 – 0 – 3**

**23A04505**                    **ELECTRONIC  CIRCUITS**
                                  **(Open Elective –I)**

**Course Objectives:**

1. To understand semiconductor diodes, their characteristics and applications.
2. To explore the operation, configurations, and biasing of BJTs.
3. To study the operation, analysis, and coupling techniques of BJT amplifiers.
4. To learn the operation, applications and uses of feedback amplifiers and oscillators.
5. To analyze the characteristics, configurations, and applications of operational amplifiers.

**Course Outcomes:**
**At the end of this course, the students will be able to**

1. Understand semiconductor diodes, their characteristics and applications.
2. Explore the operation, configurations, and biasing of BJTs.
3. Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
4. Learn the operation, applications and uses of feedback amplifiers and oscillators.
5. Analyze the characteristics, configurations, and applications of operational amplifiers.

**UNIT-I**

**Semiconductor Diode and Applications**: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

**Special Diodes:** Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED,  Varactor Diode, Photo Diode .

**UNIT-II**

**Bipolar Junction Transistor (BJT):** Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

**UNIT-III**

**Single stage amplifiers:** Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

**Multistage amplifiers:** Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

**UNIT-IV**

**Feedback amplifiers**: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

**Oscillators:** Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

**UNIT-V**

**Op-amp:** Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

**Applications of op-amp :** Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

**TEXT BOOKS:**

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3$^{rd}$ edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5$^{th}$ Edition, Oxford University press. 2008.

**REFERENCE BOOKS:**

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LousisNashelsky and K.Lal Kishore, 12$^{th}$ edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3$^{rd}$ Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5$^{th}$ Edition, Oxford University Press.

**III B.Tech I Sem**

| 23A05505a | JAVA PROGRAMMING<br>(Open Elective-I) | L | T | P | C |
|-----------|---------------------------------------|---|---|---|---|
|           |                                       | 3 | 0 | 0 | 3 |

**Course Objectives:** The main objective of the course is to Identify Java language components and how they work together in applications

- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception
- handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apisfor program development


**Course Outcomes**: After completion of the course, students will be able to
**CO1:** Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
**CO2:** Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
**CO3:** Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
**CO4:** Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
**CO5:** Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.

**Unit – I: Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types, **Variables, and Operators :**Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.
**Control Statements:** Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

**Unit II:Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.
**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

**Unit III: Arrays:**Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.
**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super ClassObject Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.
**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

**Unit IV: Packages and Java Library:** Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Autounboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.
**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.
**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

**Unit V: String Handling in Java:** Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings,Comparison, Modifying, Searching; Class String Buffer.
**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface
**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

**Learning Resources:**
**Textbooks:**
1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
**3.** JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.
**Reference Books:**
1. The complete Reference Java, 11thedition, Herbert Schildt,TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources:

1. *https://nptel.ac.in/courses/106/105/106105191/*
2. *https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618 816347 _shared/overv*iew

**III B.Tech I Sem**

| 23A05505b | FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE (Open Elective-I) | L | T | P | C |
|-----------|----------------------------------------------------------|---|---|---|---|
|           |                                                          | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic
- search together with the time and space complexities.

- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

**UNIT - I**
**Introduction to AI -** Intelligent Agents, Problem-Solving Agents,

**Searching for Solutions** - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

**UNIT-II**
**Games** - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, **Logic-** Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

**UNIT-III**
**First-Order Logic -** Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

**UNIT-IV**
**Planning** - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

**UNIT-V**
**ProbabilisticReasoning:**
Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

**TEXT BOOK:**
  1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

**REFERENCE BOOKS:**

  1.  Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
  2.  Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
  3.  Artificial Intelligence, Shivani Goel, Pearson Education.
  4.  Artificial Intelligence and Expert systems – Patterson, Pearson Education.

| 23A05505c | **QUANTUM TECHNOLOGIES AND APPLICATIONS** <br> **Open Elective – I** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | **3** |

| **Course Objectives:** |
|---|
| • To introduce the fundamentals of quantum mechanics relevant to quantum technologies. |
| • To explain key quantum phenomena and their role in enabling novel technologies. |
| • To explore applications in quantum computing, communication, and sensing. |
| • To encourage understanding of emerging quantum-based technologies and innovations. |

| **Syllabus** |
|---|

| **UNIT I: Fundamentals of Quantum Mechanics (7 Hours)** |
|---|
| • Classical vs Quantum Paradigm |
| • Postulates of Quantum Mechanics |
| • Wavefunction and Schrödinger Equation (Time-independent) |
| • Quantum states, Superposition, Qubits |
| • Measurement, Operators, and Observables |
| • Entanglement and Non-locality |

| **UNIT II: Quantum Computing** |
|---|
| • Qubits and Bloch Sphere |
| • Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates |
| • Quantum Circuits |
| • Basic Algorithms: Deutsch-Jozsa. Gover's, Shor's (conceptual) |
| • Error Correction and Decoherence |

| **UNIT III: Quantum Communication and Cryptography (7 Hours)** |
|---|
| • Teleportation & No-Cloning |
| • BB84 Protocol |
| • Quantum Networks & Repeaters |
| • Classical vs Quantum Cryptography |
| • Challenges in Implementation |

| **UNIT IV: Quantum Sensors and Metrology** |
|---|
| • Quantum Sensing: Principles and Technologies |
| • Quantum-enhanced Measurements |
| • Atomic Clocks, Gravimeters |
| • Magnetometers, NV Centers |
| • Industrial Applications |
| • |

| **UNIT V: Quantum Materials and Emerging Technologies** |
|---|
| • Quantum Materials: Superconductors, Topological Insulators |
| • Quantum Devices: Qubits, Josephson Junctions |
| • National Quantum Missions (India, EU, USA, China) |
| • Quantum Careers and Industry Initiatives |

| **Textbooks and References** |
|---|

| **Primary Textbooks:** |
|---|
| • "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press) |

| |
|---|
| • "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books) |

| **Supplementary Reading:** |
|---|
| • "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press) |
| • "Quantum Physics: A Beginner's Guide" by Alastair I.M. Rae |
| • "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca |
| • IBM Quantum Experience and Qiskit Documentation (https://qiskit.org/) |

| **Course Outcomes** |
|---|
| • Understand key quantum mechanical concepts and phenomena. |
| • Comprehend the structure and function of quantum algorithms and circuits. |
| • Explore applications in quantum communication and cryptography. |
| • Appreciate the role of quantum technologies in modern engineering systems. |

**III B.Tech I Sem**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**23A54501          MATHEMATICS FOR MACHINE LEARNING AND AI**
**(Open Elective 1)**

**Course Objectives:**

- To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
- To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
- To equip students with optimization techniques and graph-based methods used in AI applications.
- To develop critical problem-solving skills for analysing mathematical formulations in AI/ML.

**Course Outcomes:**

**After successful completion of this course, the students should be able to:**

| COs | Statements | Blooms level |
|---|---|---|
| CO1 | Apply linear algebra concepts to ML techniques like PCA and regression. | L3 (Apply) |
| CO2 | Analyze probabilistic models and statistical methods for AI applications. | L4 (Analyze) |
| CO3 | Implement optimization techniques for machine learning algorithms. | L3 (Apply) |
| CO4 | Utilize vector calculus and transformations in AI-based models. | L3 (Apply) |
| CO5 | Develop graph-based AI models using mathematical representations. | L5 (Evaluate) |

**Course Articulation Matrix:**

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 |
| CO2 | 3 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 2 |
| CO4 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 |
| CO5 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 |

• **3** = Strong Mapping, **2** = Moderate Mapping, **1** = Slight Mapping, **-** = No Mapping

**UNIT I: Linear Algebra for Machine Learning(08)**

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

**UNIT II: Probability and Statistics for AI(08)**

Probability distributions: Gaussian, Binomial, Poisson. Bayes' Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

### UNIT III: Optimization Techniques for ML(08)

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions.Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.

### UNIT IV: Vector Calculus & Transformations(08)

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

### UNIT V: Graph Theory for AI(08)

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

**Textbooks:**

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.

2. Pattern Recognition and Machine Learningby Christopher Bishop, Springer.

**Reference Books:**

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.

2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

**Web References:**
- MIT– Mathematics for Machine Learning https://ocw.mit.edu
- Stanford CS229 – Machine Learning Course https://cs229.stanford.edu/

DeepAI – Mathematical Foundations for AI https://deepai.org

**III B.Tech I Sem**

| 23A56501 | **MATERIALS CHARACTERIZATION TECHNIQUES**<br>(Common to all branches) (Open Elective-Interdisciplinary)<br>**(Open Elective-I)** | Credits<br>3-0-0:3 |
|---|---|---|

| COURSE OBJECTIVES | |
|---|---|
| 1 | To provide exposure to different characterization techniques. |
| 2 | To explain the basic principles and analysis of different spectroscopic techniques. |
| 3 | To elucidate the working of Scanning electron microscope - Principle, limitations and applications. |
| 4 | To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications. |
| 5 | To educate the uses of advanced electric and magnetic instruments for characterization. |

### UNIT  I Structure analysis by Powder X-Ray Diffraction                9H

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

### UNIT  II Microscopy technique -1 –Scanning Electron Microscopy (SEM)        9H

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

### UNIT  III Microscopy Technique -2 - Transmission Electron Microscopy (TEM)      9H

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

### UNIT  IV    Spectroscopy techniques                        9H
Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

### UNIT  V Electrical & Magnetic Characterization techniques            9H
Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

**Textbooks:**
1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

**Reference Books:**
1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. **Materials  Characterization Techniques -**Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

**NPTEL courses link** :

1. **https://nptel.ac.in/courses/115/103/115103030/**
2. **https://nptel.ac.in/content/syllabus_pdf/113106034.pdf**
3. **https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/**

| | **Course Outcomes** | **Blooms Level** |
|---|---|---|
| **CO1** | Analyze the crystal structure and crystallite size by various methods | L1,L2, L3, L4 |
| **CO2** | Analyze the morphology of the sample by using a Scanning Electron Microscope | L1,L2, L4 |
| **CO3** | Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope | L1,L2, L3 |
| **CO4** | Explain the principle and experimental arrangement of various spectroscopic techniques | L1,L2 |
| **CO5** | Identify the construction and working principle of various Electrical & Magnetic Characterization technique | L1,L2 |

Course Articulation Matrix:

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | | | | | | | |
| **CO2** | 3 | 3 | 2 | 1 | 1 | | | | | | | |
| **CO3** | 3 | 3 | 2 | 1 | 1 | | | | | | | |
| **CO4** | 3 | 2 | 1 | 1 | - | | | | | | | |
| **CO5** | 3 | 3 | 1 | 1 | - | | | | | | | |

1-Slightly, 2-Moderately, 3-Substantially.

**III B.Tech I Sem**

| Course Code | Title of the Subject | L | T | P | C |
|---|---|---|---|---|---|
| 23A51501 | **CHEMISTRY OF ENERGY SYSTEMS** | 3 | | - | 3 |

| COURSE OBJECTIVES | |
|---|---|
| 1 | To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries. |
| 2 | To understand the basic concepts of processing and limitations of Fuel cells & their applications. |
| 3 | To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications |
| 4 | Necessarily of harnessing alternate energy resources such as solar energy and its basic concepts. |
| 5 | To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method. |

| COURSE OUTCOMES | |
|---|---|
| CO1 | ➢ Solve the problems based on electrode potential, Describe the Galvanic Cell <br> ➢ Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer |
| CO2 | ➢ Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell <br> ➢ Discuss about the Basic design of fuel cells, Classify the fuel cell |
| CO3 | ➢ Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, <br> ➢ Interpret advantages of photoelectron catalytic conversion. |
| CO4 | ➢ Apply the photo voltaic technology, Demonstrate about solar energy and prospects <br> ➢ Illustrate the Solar cells, Discuss about concentrated solar power |
| CO5 | ➢ Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures <br> ➢ Describe the liquification methods. |

## <u>Mapping between Course Outcomes and Programme Outcomes</u>

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | | | | | | | |
| CO2 | | | | | | | | | | | | |
| CO3 | | | | | | | | | | | | |
| CO4 | | | | | | | | | | | | |
| CO5 | | | | | | | | | | | | |

**UNIT-1: Electrochemical Systems:** Galvanic cell,  Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead-acid ,Nickel- cadmium, Lithium ion batteries and their applications**.**

**UNIT-2: Fuel Cells:** Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

**UNIT-3: Photo and Photo electrochemical Conversions:** Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

**UNIT-4: Solar Energy:** Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.          .

**UNIT-5: Hydrogen Storage:**Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

**Text books**

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

**Reference Books:**
1. Fuel Cell Hand Book 7$^{th}$ Edition, by US Department of Energy (EG&G technical services And corporation)
 2. Hand book of solar energy and applications by ArvindTiwari and Shyam.
 3. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
 4.Hydrogen storage by Levine Klebonoff

**III B.Tech I Sem**

| Course Code | **ENGLISH FOR COMPETITIVE EXAMINATIONS** | L | T | P | C |
|---|---|---|---|---|---|
| 23A52502a | **(Open Elective-I)**<br>(Common to All Branches of Engineering) | 3 | 0 | 0 | 3 |

| Course Objectives: |
|---|
| 1. To enable the students to learn about the structure of competitive English<br>2. To understand the grammatical aspects and identify the errors<br>3. To enhance verbal ability and identify the errors<br>4. To improve word power to answer competitive challenges<br>5. To make them ready to crack competitive exams |

| Course Outcomes (CO): | Blooms Level |
|---|---|
| By the end of the program students will be able to |  |
| ▪ Identify the basics of English grammar and its importance | L1, L2 |
| ▪ Explain the use of grammatical structures in sentences | L1, L2 |
| ▪ Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams | L3 |
| ▪ Analyze an unknown passage and reach conclusions about it. | L4 |
| ▪ Choose the appropriate form of verbs in framing sentences | L5 |
| ▪ Develop speed reading and comprehending ability thereby perform better in competitive exams<br><div align="center">L3</div> |  |

| UNIT - I | **GRAMMAR-1** | Lecture Hrs |
|---|---|---|
| <u>Nouns</u>-classification-errors-<u>Pronouns</u>-types-errors-<u>Adjectives</u>-types-errors-<u>Articles</u>-definite-indefinite-Degrees of Comparison-<u>Adverbs</u>-types- errors-<u>Conjunctions</u>-usage-<br><u>Prepositions</u>-usage-Tag Questions, types-identifying errors- Practice | | |

| UNIT - II | **GRAMMAR-2** | Lecture Hrs |
|---|---|---|
| Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause-Voice-active voice and passive voice- reported <u>Speech</u>-Agreement- subject and verb-Modals-<u>Spotting Errors</u>-Practices | | |

| UNIT - III | **VERBAL ABILITY** | Lecture Hrs |
|---|---|---|
| Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph. | | |

| UNIT - IV | **READING COMPREHENSION AND VOCUBULARY** | Lecture Hrs |
|---|---|---|
| Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, <u>Affixes</u>-Prefix &Suffix-One word substitutes-<u>Compound words</u>-<u>Phrasal Verbs</u>-<u>Idioms and Phrases</u>-<u>Homophones</u>-Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods | | |

| UNIT - V | **WRITING FOR COMPETITIVE EXAMINATIONS** | Lecture Hrs |
|---|---|---|
| Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs-Essay writing-types | | |

| **Textbooks:** |
|---|
| 1. **Wren & Martin,** *English for Competitive Examinations,* **S.Chand & Co, 2021**<br>2. *Objective English for Competitive Examination,* Tata McGraw Hill, New Delhi, 2014. |

**Reference Books:**
1. Hari Mohan Prasad, *Objective English for Competitive Examination,* Tata McGraw Hill, New Delhi, 2014.
2. Philip  Sunil Solomon, *English for Success in Competitive Exams*, Oxford 2016
3. Shalini Verma , *Word Power Made Handy*, S Chand Publications
4. Neira, Anjana Dev & Co. *Creative Writing: A Beginner's Manual.* Pearson Education India, 2008.
5. Abhishek Jain,Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.
6. Michel Swan, *Practical English Usage*,Oxford,2006.

**Online Resources**

**1. https://www.grammar.cl/english/parts-of-speech.htm**

**2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech**

**3. https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice**

**4. https://languagetool.org/insights/post/verb-tenses/**

**5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council**

**6. https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx**

| Course Code | ENTREPRENEURSHIP AND NEW VENTURE CREATION (Open Elective-I) | L | T | P | C |
|---|---|---|---|---|---|
| 23A52502b | | 3 | 0 | 0 | 3 |

| COURSE OBJECTIVES: The objectives of this course are | |
|---|---|
| 1 | To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership. |
| 2 | To encourage creativity and innovation |
| 3 | To enable them to learn pitching and presentation skills |
| 4 | To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept. |
| 5 | To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona |

**UNIT-I: Entrepreneurship Fundamentals and context**

Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16industries to choose from), Venture Activity

**LEARNING OUTCOMES**

At the end of the Unit, the learners will be able to

➢ Understand theconcept of Entrepreneur and Entrepreneurship in India
➢ Analyze recent trends in Entrepreneurship role in economic development
➢ Develop a creative mind set and personality in starting a business.

**Unit II: Problem & Customer Identification**

Understanding and analysing the macro-Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

**LEARNING OUTCOMES**

At the end of the Unit, the learners will be able to

➢ Understand the problem and Customer identification.
➢ Analyze problem and validating with potential customer
➢ Evaluate customer segmentation and customer personas

**Unit III: Solution design, Prototyping & Opportunity Assessment and Sizing**

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

## LEARNING OUTCOMES

At the end if the Unit, the learners will be able to

> ➢ Analyze jobs-to-be-done
> ➢ Evaluate customer needs to create a strong value proposition
> ➢ Design and draw prototyping and MVP

## UNIT-IV: Business & Financial Model, Go-to-Market Plan

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.

Business planning: components of Business plan- Sales plan, People plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.

Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.

Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.

Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

## LEARNING OUTCOMES

At the end of the Unit, the learners will be able to:

> ➢ Understand lean approach in business models
> ➢ Apply business plan, sales plan and financial plan
> ➢ Analyze financial planning, marketing channels of distribution.
> ➢ Design their own venture and source of funds.

## UNIT-V: Scale Outlook and Venture Pitch readiness

Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

## LEARNING OUTCOMES

At the end of the Unit, the learners will be able to

> ➢ Understand aspiration for scale
> ➢ Analyze venture idea and its key components
> ➢ Evaluate and build investors ready pitch

**TEXT BOOKS**

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha . *Entrepreneurship*, McGrawHill, 11th Edition.(2020)
2. Ries, E. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.* Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers.* John Wiley & Sons. (2010).

**REFERENCES**

1. Simon Sinek,*Start with Why,* Penguin Books limited. (2011)
2. Brown Tim,*Change by Design Revised & Updated: How Design Thinking*
3. *Transforms Organizations and Inspires Innovation,* Harper Business.(2019)

4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.

**E-RESOURCES**

 Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of

custom created modular content + 500+ components of the most relevant curated content)

| **COURSE OUTCOMES:** At the end of the course, students will be able to | | **BTL** |
|------|------|------|
| CO1 | Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship | L3 |
| CO2 | Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution | L3 |
| CO3 | Analyze and refine business models to ensure sustainability and profitability | L3 |
| CO4 | Build Prototype for Proof of Concept and validate MVP of their practice venture idea | L4 |
| CO5 | Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture | L5 |
| CO6 | Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders | L6 |

BTL: Bloom's Taxonomy Level

**III B.Tech.II Semester**

| Course Code | **DISASTER MANAGEMENT** | L | T | P | C |
|---|---|---|---|---|---|
| **23A01606a** | **(Open Elective – II)** | 3 | 0 | 0 | 3 |

Course Objectives:

**The objectives of this course are to make the student :**
1. To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. To apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

Course Outcomes:

**After successful completion of this course, students will be able to:**
1. Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. Apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

CO – PO Articulation Matrix

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | - | 2 | - | 2 | 2 | - | - | - | 3 | 3 |
| **CO -2** | - | 3 | - | - | 2 | - | - | - | - | - | - | 2 | 3 | - |
| **CO -3** | 3 | - | - | 3 | - | - | 3 | - | - | 2 | - | - | - | 3 |
| **CO -4** | - | - | 3 | - | 3 | - | - | 2 | - | - | - | - | 3 | - |
| **CO -5** | - | - | - | 3 | - | 3 | 3 | 3 | 2 | - | - | - | - | 3 |

| **UNIT – I** | | |
|---|---|---|

Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

| **UNIT – II** | | |
|---|---|---|

Cyclones and Their Impact– Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structuresin Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

| **UNIT – III** | | |
|---|---|---|
| Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas. | | |

| **UNIT – IV** | | |
|---|---|---|
| Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening. | | |

| **UNIT – V** | | |
|---|---|---|
| Planning and Design Considerations for Seismic Safety– General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques. | | |

| **TEXT BOOKS:** |
|---|
| 1. David Alexander, *Natural Disasters*, 1st Edition, CRC Press, 2017. |
| 2. Edward A. Keller and Duane E. DeVecchio, *Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes*, 5th Edition, Routledge, 2019. |

| **REFRENCE BOOKS:** |
|---|
| 1. Ben Wisner, J.C. Gaillard, andIlanKelman (Editors), *Handbook of Hazards and Disaster Risk Reduction and Management*, 2nd Edition, Routledge, 2012. |
| 2. Damon P. Coppola, *Introduction to International Disaster Management*, 4th Edition, Butterworth-Heinemann, 2020. |
| 3. BimalKanti Paul, *Environmental Hazards and Disasters: Contexts, Perspectives and Management*, 2nd Edition, Wiley-Blackwell, 2020. |

| **Online Learning Resources:** |
|---|
| **https://nptel.ac.in/courses/124107010** **https://onlinecourses.swayam2.ac.in/cec19_hs20/preview** |

**III B.Tech – II Semester**

| Course Code | SUSTAINABILITY IN ENGINEERING PRACTICES (OE – II) | L | T | P | C |
|---|---|---|---|---|---|
| **23A01606b** | | 3 | 0 | 0 | 3 |

Course Objectives:
**The objectives of this course are to make the student :**
1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. To analyze sustainable construction materials, their durability, and life cycle assessment.
3. To apply energy calculations in construction materials and assess their embodied energy.
4. To evaluate green building standards, energy codes, and performance ratings.
5. To assess the environmental effects of energy use, climate change, and global warming.

Course Outcomes:
**After successful completion of this course, students will be able to:**
1. Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. Analyze sustainable construction materials, their durability, and life cycle assessment.
3. Apply energy calculations in construction materials and assess their embodied energy.
4. Evaluate green building standards, energy codes, and performance ratings.
5. Assess the environmental effects of energy use, climate change, and global warming.

CO – PO Articulation Matrix

| Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | - | 2 | 3 | 2 | - | - | - | - | 3 | 3 |
| **CO -2** | - | 3 | - | - | 2 | - | 3 | - | - | - | - | 2 | 3 | 3 |
| **CO -3** | - | - | 3 | 3 | 3 | - | 2 | - | - | 2 | - | - | 3 | 3 |
| **CO -4** | - | - | 3 | 3 | 3 | - | 3 | 2 | - | - | - | - | 3 | 3 |
| **CO -5** | - | - | - | - | - | 3 | 3 | 3 | - | - | - | - | - | 3 |

| **UNIT – I** | | |
|---|---|---|

**INTRODUCTION**
Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - $CO_2$ Contribution From Cement and Other Construction Materials.

| **UNIT – II** | | |
|---|---|---|

**MATERIALS USED in SUSTAINABLE CONSTRUCTION**
Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

| **UNIT – III** | | |
|---|---|---|

**ENERGY CALCULATIONS**
Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use

| UNIT – IV | | |
|---|---|---|
| **GREEN BUILDINGS** <br><br> Control of Energy Use in  Building - ECBC Code, Codes in  Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings - Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building | | |

| UNIT – V | | |
|---|---|---|
| **ENVIRONMENTAL EFFECTS** <br><br> Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change. | | |

**TEXT BOOKS:**

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.

**REFRENCE BOOKS:**

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practicesin  the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012.

**Online Learning Resources:**
**https://archive.nptel.ac.in/courses/105/105/105105157/**

**III B.Tech.II Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### 23A02605      RENEWABLE ENERGY SOURCES
### (Open Elective-II)

Course Outcomes (CO): At the end of the course the student will be able to:

CO 1: Understand principle operation of various renewable energy sources.  L1
CO 2: Identify site selection of various renewable energy sources. L2
CO 3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomasss, Tidal Wave and Fuel cell energies L3
CO 4:  Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems. L5
CO 5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power. L4

### UNIT I Solar Energy:

Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

### UNIT II PV Energy Systems:

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

### UNIT III Wind Energy:

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

### UNIT IV Geothermal Energy:

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

### UNIT – V Miscellaneous Energy Technologies:

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and  limitations.
Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration
Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

**Text books:**

1.G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

2.Chetan Singh Solanki "Solar Photovoltaics fundamentals, technologies and applications" 2nd Edition PHI Learning Private Limited. 2012.

Reference Books:

1.Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.

2.S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.

3.B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.

4.S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.

5.G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.


Online Learning Resources:

1. https://nptel.ac.in/courses/103103206

2. https://nptel.ac.in/courses/108108078

**III B. Tech -II Sem**　　　　　　　　　　　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　**3　0　0　3**

　　　　　　**23A030606**　　　　**AUTOMATION AND ROBOTICS**
　　　　　　　　　　　　　　　　　　(Open Elective – II)

| Course objectives: Theobjectives of the courseareto | |
|---|---|
| 1 | Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes. |
| 2 | Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation. |
| 3 | Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments. |
| 4 | Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications. |
| 5 | Familiarity of industrial automation and robotics, and practical applications in manufacturing processes. |

| COURSE OUTCOMES On successful completion of this course the student will be able to | | |
|---|---|---|
| 1 | Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production. | *L2,L4,L5* |
| 2 | Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques. | L4,L5,L6 |
| 3 | Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility. | L2,L3,L4 |
| 4 | Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems. | L3,L4,L5 |
| 5 | Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks. | L1,L3,L6 |

**UNIT-I**
**Introduction to Automation:**
Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

　　　　　　　　　　　　　　**UNIT–II**
**Automated flow lines**:
Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

## UNIT-III
### Introduction to Industrial Robotics:
Introduction to Industrial Robotics,Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

## UNIT-IV
### Manipulator Kinematics:
Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

## UNIT-V
### Robot Programming:
Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

### Text Books:
1. Automation,ProductionsystemsandCIM,M.P.Groover/PearsonEdu.
2. IndustrialRobotics -M.P.Groover,TMH.
3.

### References:
1. Robotics,FuKS, McGrawHill,4thedition,2010.
2. AnIntroductiontoRobotTechnology,P.CoiffetandM.Chaironze,KogamPageLtd. 1983 London.
3. RoboticEngineering,RichardD.Klafter,PrenticeHall
4. Robotics,FundamentalConceptsandanalysis–AshitaveGhosal,OxfordPress,1/e,2006
5. RoboticsandControl, MittalRK&NagrathIJ,TMH.

### OnlineLearningResources:

https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o

**https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3Z JgwEjyE**

**III B.Tech II Sem**

**L – T – P – C          3 – 0 – 0 – 3**

**23A04606**                          **DIGITAL  ELECTRONICS**
                                    **(Open Elective –II)**

**Course Objectives:**

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

**Course Outcomes:**
**At the end of this course, the students will be able to**

1. Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. Analyze combinational circuits like adders, subtractors, and code converters.
3. Explore combinational logic circuits and their applications in digital design.
4. Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. Gain knowledge about programmable logic devices and digital IC's.

**UNIT-I**

**Logic Simplification and Combinational Logic Design**: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

**UNIT-II**
**Introduction to Combinational Design 1**: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.
**UNIT-III**
**Combinational Logic Design 2:** Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.
**UNIT-IV**
**Sequential Logic Design**: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.
**UNIT-V**
**Programmable Logic Devices:**ROM, Programmable Logic Devices (PLA and PAL).
**Digital IC's:**Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

**TEXT BOOKS:**

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

**REFERENCE BOOKS:**

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004.

**III B.Tech II Sem**

| 23A32501T | OPERATING SYSTEMS (Open Elective-II) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:** The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

**Course Outcomes:** After completion of the course, students will be able to

**CO1:** Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)

**CO2:** Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)

**CO3:** Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. (L3)

**CO4:** Illustrate different conditions for deadlock and their possible solutions. (L2) □Analyze the memory management and its allocation policies. (L4)

CO5: Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms,

**UNIT - I Operating Systems Overview, System Structures**                      Lecture 8Hrs
Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

**UNIT - II Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication**                                                      Lecture
10Hrs
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

**UNIT - III Memory-Management Strategies, Virtual Memory Management**          Lecture
8Hrs
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

**UNIT - IV Deadlocks, File Systems** Lecture 9Hrs

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

**UNIT - V System Protection, System Security** Lecture 8Hrs

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

**Textbooks:**
1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)

**Reference Books:**
1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

**Online Learning Resources:**
https://nptel.ac.in/courses/106/106/106106144/
http://peterindia.net/OperatingSystems.html

*III B.Tech – II Sem*

| 23A31401T | **MACHINE LEARNING** | L | T | P | C |
|-----------|---------------------|---|---|---|---|
|           | **(Open Elective-II)** | 3 | 0 | 0 | 3 |

**Course Objectives:** The objectives of the course are
- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

,
**Course Outcomes**:
- CO1: Identify machine learning techniques suitable for a given problem. (L3)
- CO2: Solve real-world problems using various machine learning techniques. (L3)
- CO3: Apply Dimensionality reduction techniques for data preprocessing. (L3)
- CO4: Explain what is learning and why it is essential in the design of intelligent machines. (L2)
- CO5: Evaluate Advanced learning models for language, vision, speech, decision making etc. (L5)

**UNIT-I: Introduction to Machine Learning:** Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

**UNIT-II: Nearest Neighbor-Based Models:** Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

**UNIT-III: Models Based on Decision Trees**: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.
**The Bayes Classifier:** Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

**UNIT-IV: Linear Discriminants for Machine Learning**: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

**UNIT-V: Clustering** : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

**Textbooks:**

1."Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

**Reference Books:**

1."Machine Learning", Tom M. Mitchell, McGraw-Hill Publication, 2017
2."Machine Learning in Action",Peter Harrington, DreamTech
3."Introduction to  Data Mining", Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

**III B.Tech II Sem**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### 23A54601a   OPTIMIZATION TECHNIQUES
#### (Open Elective -II)

**Course Outcomes:**

**After successful completion of this course, the students should be able to:**

| COs | Statements | Blooms level |
|-----|------------|--------------|
| CO1 | Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry. | L2, L3 |
| CO2 | Interpret the transportation models' solutions and infer solutions to the real-world problems. | L3, L5 |
| CO3 | Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications. | L3 |
| CO4 | Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives | L2, L3 |
| CO5 | Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives. | L3,L5 |

**Course Articulation Matrix:**

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 |
| CO2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 |
| CO3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 |
| CO4 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 |
| CO5 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 |

1-Slightly,      2-Moderately, 3-Substantially.

**UNIT – I: Linear programming I**                                      **(08)**

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

**UNIT – II Linear programming II: Duality in Linear Programming**                **(08)**

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

**UNIT – III Non-linear programming: Unconstrained optimization techniques**       **(08)**

Introduction: Classification of Unconstrained minimization methods,

**Direct Search Methods:** Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

**UNIT – IV Non-linear programming: Constrained optimization techniques**          **(08)**

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

**UNIT-V Geometric Programming**                                                    **(08)**

**Unconstrained Minimization Problems:** solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

**Constrained minimization Problems:** Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

**TEXT BOOK:**

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

**REFERENCES:**

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

Web Reference:

- https://onlinecourses.nptel.ac.in/noc24_ee122/preview

- https://archive.nptel.ac.in/courses/111/105/111105039/

- https://onlinecourses.nptel.ac.in/noc21_ce60/preview

| 23A54601b | MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES Open Elective – II | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:**

- To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
- To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
- To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
- To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
- To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

**Course Outcomes:**

**After successful completion of this course, the students should be able to:**

| COs | Statements | Blooms level |
|---|---|---|
| CO1 | Understand vector spaces, inner products, and linear operators with applications to quantum systems. | L1, L2 (Understand, Comprehend) |
| CO2 | Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems. | L3, L4 (Apply, Analyze) |
| CO3 | Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution. | L4 (Analyze) |
| CO4 | Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations. | L3, L5 (Apply, Evaluate) |
| CO5 | Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory. | L5, L6 (Evaluate, Create) |

**Course Articulation Matrix:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 2 |
| CO2 | 3 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | - | 3 |

• **3** = Strong Mapping, **2** = Moderate Mapping, **1** = Slight Mapping, **-** = No Mapping

**UNIT I: Linear Algebra Foundation for Quantum Mechanics (10 hours)**

Vector spaces definition and examples (R², R³, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-

dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle\varphi|$, $\langle\varphi|\psi\rangle$), Change of basis (transformations, unitary matrices).

## UNIT II: From Finite to Infinite Dimensions (08 hours)

Function spaces (L² space, square-integrable functions), Inner products for functions ($\int\psi^*\varphi\, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

## UNIT III: Quantum Mechanical Formalism (08 hours)

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

## UNIT IV: Applications and Statistical Interpretation (06 hours)

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

## UNIT V: Advanced Topics (08 hours)

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

### Textbooks:

1. David J. Griffiths, Darrell F. Schroeter, "Introduction to Quantum Mechanics", 3rd Edition, Cambridge University Press (2018).

2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

### Reference Books:

1. George. F. Simmons, "Introduction to Topology and Modern Analysis",MedTech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics,Princeton Univ. Press (1996).

### Web Resources
1. https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
2. https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

**III B.Tech II Sem**

| 23A56601 | **PHYSICS OF ELECTRONIC MATERIALS AND DEVICES**<br>(Common to all branches)<br>Open Elective-II | Credits<br>3-0-0:3 |
|---|---|---|

| | **Course Objectives** |
|---|---|
| 1 | To make the students to understand the concept of crystal growth, defects in crystals and thin films. |
| 2 | To provide insight into various semiconducting materials and their properties. |
| 3 | To develop a strong foundation in semiconductor physics and device engineering. |
| 4 | To elucidate excitonic and luminescent processes in solid-state materials. |
| 5 | To understand the principles, technologies, and applications of modern display systems. |

**Syllabus:**

**UNIT-**I **Fundamentals of Materials Science**                                                                 **9H**
Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

**UNIT   II Semiconductors**                                                                 **9H**
Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

**UNIT   III Physics of Semiconductor Devices:**                                                                 **9H**
Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

**UNIT   IV   Excitons and Luminescence:**                                                                 **9H**
Luminescence:  Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photoluminescence : General Principles of photoluminescence,  Excitation and relaxation,  OLED, Quantum-dot.
Electro-luminescence :  General Principles of electroluminescence, light emitting diode, diode laser.

**UNIT   V Display devices :**                                                                 **9H**
LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display,

MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

**Textbooks:**
1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt.

Ltd.,4[th]edition, 2021.

2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

**Reference Books:**

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

NPTEL course links:
**https://nptel.ac.in/courses/113/106/113106062/**

**https://onlinecourses.nptel.ac.in/noc20_ph24/preview**

|     | **Course Outcomes** | **Blooms Level** |
|-----|---------------------|------------------|
| **CO1** | Understand crystal growth and thin film preparation | L1,L2 |
| **CO2** | Summarize the basic concepts of semiconductors | L1,L2 |
| **CO3** | Illustrate the working of various semiconductor devices | L1,L2, L3 |
| **CO4** | Analyze various luminescent phenomena and the devices based on these concepts | L1,L2, L3 |
| **CO5** | Explain the working of different display devices | L1,L2 |

### Course Articulation Matrix:

|     | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|-----|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| **CO1** | 3 | 3 | 2 | 2 | 1 |   |   |   |   |   |   |   |
| **CO2** | 3 | 3 | 2 | 1 | 1 |   |   |   |   |   |   |   |
| **CO3** | 3 | 3 | 2 | 1 | 1 |   |   |   |   |   |   |   |
| **CO4** | 3 | 2 | 1 | 1 | - |   |   |   |   |   |   |   |
| **CO5** | 3 | 3 | 1 | 1 | - |   |   |   |   |   |   |   |

1-Slightly, 2-Moderately,3-Substantially.

**III B.Tech –II Sem**

| 23A51601 | **CHEMISTRY OF POLYMERS AND APPLICATIONS**<br>(Common to all branches)<br>Open Elective-II | Credits<br>3-0-0:3 |
|---|---|---|
| **Course Objectives** | | |
| 1 | To understand the basic principles of polymers | |
| 2 | To understand natural polymers and their applications. | |
| 3 | To impart knowledge to the students about synthetic polymers, their preparation and importance. | |
| 4 | To enumerate the applications of hydogel polymers | |
| 5 | To enumerate applications of conducting and degradable polymers in engineering. | |

| **Course Outcomes** | |
|---|---|
| CO1 | Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer |
| CO2 | Describe the physical and chemical properties of natural polymers and Modified cellulosics. |
| CO3 | Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers. |
| CO4 | Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery, |
| CO5 | Explain classification and mechanism of conducting and degradable polymers. |

## Mapping between Course Outcomes and Programme Outcomes

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | | | | | | | |
| CO2 | | | | | | | | | | | | |
| CO3 | | | | | | | | | | | | |
| CO4 | | | | | | | | | | | | |
| CO5 | | | | | | | | | | | | |

**Unit – I: Polymers-Basics and Characterization:-**

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

**Unit – II: Natural Polymers & Modified cellulosics**

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

## Unit – III: Synthetic Polymers

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

## Unit-IV: Hydrogels of Polymer networks

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

## Unit – V: Conducting and Degradable Polymers:

**Conducting polymers**: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping,Applications.

**Degradable polymers**: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

## Text Books:

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

## References Books:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall

    2.Advanced Organic Chemistry, B.Miller, Prentice Hall

    3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.

**III B.Tech –II Sem**

| 23A52602 | **ACADEMIC WRITING AND PUBLIC SPEAKING** (Common to All Branches of Engineering) **OPEN ELECTIVE - II** | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

| Course Objectives: |
|---|

- To encourage all round development of the students by focusing on writing skills
- To make the students aware of non-verbal skills
- To develop analytical skills
- To deliver effective public speeches

| Course Outcomes (CO): | Blooms Level |
|---|---|

By the end of the program students will be able to

| | |
|---|---|
| • Understand various elements of Academic Writing | L1, L2 |
| • Identify sources and avoid plagiarism | L1, L2 |
| • Demonstrate the knowledge in writing a Research paper | L3 |
| • Analyse different types of essays | L4 |
| • Assess the speeches of others and know the positive strengths of speakers | L5 |
| • Build confidence in giving an impactful presentation to the audience | L3 |

| UNIT - I | Introduction to Academic Writing | Lecture Hrs |
|---|---|---|

Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing

| UNIT - II | **Academic Journal Article** | Lecture Hrs |
|---|---|---|

Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism

| UNIT - III | **Essay & Writing Reviews** | Lecture Hrs |
|---|---|---|

Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP

| UNIT - IV | Public Speaking | Lecture Hrs |
|---|---|---|

Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events

| UNIT - V | Public Speaking and Non-Verbal Delivery | Lecture Hrs |
|---|---|---|

Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics - Paralanguage - Signs

| Textbooks: |
|---|

1. *Critical Thinking, Academic Writing and Presentation Skills*: MG University Edition Paperback – 1 January 2010  Pearson Education; First edition (1 January 2010)
2. Pease, Allan & Barbara. *The Definitive Book of Body Language*RHUS Publishers, 2016

| Reference Books: |
|---|

1. Alice Savage, Masoud Shafiei *Effective Academic Writing,***2Ed.,**2014 .sserP ytisrevinU drofxO
2. Shalini Verma, *Body Language*, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata,*Communication Skills* 2E  2015, Oxford.
4. Sharon Gerson, Steven Gerson,*Technical Communication Process and Product,* Pearson, New Delhi, 2014
5. *Elbow, Peter. Writing with Power. OUP USA, 1998*

| Online Learning Resources: |
|---|

1. https://youtu.be/NNhTIT81nH8
2. phttps://www.youtube.com/watch?v=478ccrWKY-A

3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. https://archive.nptel.ac.in/courses/109/107/109107172/#
8. https://archive.nptel.ac.in/courses/109/104/109104107/

**IV B.Tech – I Semester**

| Course Code | BUILDING MATERIALS AND SERVICES (OPEN ELECTIVE – III) | L | T | P | C |
|---|---|---|---|---|---|
| **23A01704a** | | 3 | 0 | 0 | 3 |

Course Objectives:

**The objectives of this course are to make the student :**
1. To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. To analyze the composition, manufacturing process, and properties of cement and admixtures.
3. To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. To evaluate masonry, mortars, finishing techniques, and formwork systems.
5. To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

Course Outcomes:

**Upon successful completion of the course, students will be able to:**
1. Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. Analyze the composition, manufacturing process, and properties of cement and admixtures.
3. Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. Evaluate masonry, mortars, finishing techniques, and formwork systems.
5. Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

CO – PO Articulation Matrix

| Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | 2 | - | - | - | - | - | - | - | 3 | 3 |
| **CO -2** | 3 | 3 | - | - | 2 | - | - | - | - | - | - | 2 | 3 | 3 |
| **CO -3** | 3 | - | 3 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 |
| **CO -4** | - | - | 3 | 3 | 3 | - | 2 | - | - | - | - | - | 3 | 3 |
| **CO -5** | - | - | - | - | - | 3 | 3 | 2 | - | - | - | - | - | 3 |

**UNIT – I**

StonesandBricks, Tiles: Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – CompositionofBrick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, PaintsandPlastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

**UNIT – II**

Cement &Admixtures: Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency  – Initial &Final Setting – Soundness   . Admixtures – Mineral & Chemical Admixtures – Uses

| UNIT – III | | |

Building Components: Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types.

| UNIT – IV | | |

Mortars, MasonryandFinishing's Mortars: Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

| UNIT – V | | |

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines &Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials andTypes; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire Resistant Materials and Constructions.

**TEXT BOOKS:**
1. Building Materials and Construction – Arora&Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.

**REFRENCE BOOKS:**
1. Building Construction by B. C. Punmia, Ashok Kumar Jain andArun Kumar Jain - Laxmi Publications (P) ltd., New Delh
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N.Subramanian ,"Building Materials Testing and Sustainability", Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

**Online Learning Resources:**
**https://archive.nptel.ac.in/courses/105/102/105102088/**

**IV B.Tech – I Semester**

| Course Code | ENVIRONMENTAL IMPACT ASSESSMENT (OPEN ELECTIVE – III) | L | T | P | C |
|---|---|---|---|---|---|
| **23A01704b** | | 3 | 0 | 0 | 3 |

Course Objectives:

**The objectives of this course are to make the student to:**
1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyze the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frameworks in EIA studies.

Course Outcomes (COs):

Upon successful completion of the course, students will be able to:
1. Apply various methodologies for conducting Environmental Impact Assessments.
2. Analyze the impact of land-use changes on soil, water, and air quality.
3. Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.
4. Develop environmental audit reports and assess compliance with environmental policies.
5. Interpret and apply environmental acts and regulations related to EIA.

CO – PO Articulation Matrix

| Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | 2 | 2 | 2 | 2 | 3 | - | - | - | - | - | 1 | 2 | 2 |
| **CO -2** | 3 | 3 | 3 | 2 | 2 | 3 | - | - | - | - | - | 1 | 3 | 2 |
| **CO -3** | 3 | 3 | 3 | 2 | 2 | 3 | 3 | - | - | - | - | 1 | 3 | 3 |
| **CO -4** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | - | - | - | - | 1 | 3 | 3 |
| **CO -5** | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | - | - | - | 1 | 2 | 2 |

| **UNIT – I** | | |
|---|---|---|

**Concepts and methodologies of EIA**

Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

| **UNIT – II** | | |
|---|---|---|

**Impact of Developmental Activities and Land Use**

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I A in Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts On Surface Water Environment, Air Pollution Sources, Generalized

Approach for Assessment of Air Pollution Impact.

| UNIT – III | | |
| --- | --- | --- |

**Assessment of Impact On Vegetation, Wildlife and Risk Assessment**

Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment- Advantages of Environmental Risk Assessment.

| UNIT – IV | | |
| --- | --- | --- |

**Environmental Audit**

Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report

| UNIT – V | | |
| --- | --- | --- |

**Environmental Acts and Notifications**

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention &Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, ConceptofISO and ISO 14000.

**TEXT BOOKS:**

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

**REFRENCE BOOKS:**

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

**Online Learning Resources:**

**https://archive.nptel.ac.in/courses/124/107/124107160/**

**IV B.Tech I Sem**                                    **L – T – P – C**          **3 – 0 – 0 – 3**

**23A02704**          **SMART GRID TECHNOLOGIES**
**(Open Elective- III)**

Course Outcomes:
CO1: Understanding the Concept and Evolution of Smart Grids. L2
CO2: Analyzing Wide Area Monitoring System and Synchrophasor Technology. L4
CO3: Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts. L3
CO4: Evaluating Information and Communication Technology (ICT) Systems in Smart Grids. L5
CO5: Designing Smart Grid Applications and Cybersecurity Measures. L6

**UNIT I Introduction to Smart Grid :**
Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture.

**UNIT II Wide Area Monitoring System :**
Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.

**UNIT III Smart Meters:**
Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.

**UNIT IV Information and Communication Technology:**
Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid.

UNIT V**Smart Grid Applications and Cyber Security**:
Applications : Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles - Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.

TEXT BOOKS:
1.      James Momoh, "SMART GRID : Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2.      Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

REFERENCES:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.

2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.

3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.

4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.

**IV B.Tech I Sem**                              **L – T – P – C**        **3 – 0 – 0 – 3**

**23A03704**        **3D PRINTING TECHNOLOGIES**
**(Open Elective-III)**

| **Course objectives:** Theobjectives of the courseareto | |
|---|---|
| 1 | **Understand** the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods. |
| 2 | **Demonstrate** the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems. |
| 3 | **Define** the processes and classifications of rapid tooling and reverse engineering techniques. |
| 4 | **Identify** common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues. |
| 5 | **Familiarize** RP-related software and its role in applications such as design, manufacturing, and medical fields. |

| **Course Outcomes:**Onsuccessfulcompletionofthecourse, thestudentwillbeable to, | | |
|---|---|---|
| 1 | Define and explain the evolution and need for rapid prototyping in modern product development. | L1,L2,L6 |
| 2 | Compare and contrast various 3D printing technologies based on working principles, materials, and limitations. | L2,L4 |
| 3 | Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications. | L3,L5,L6 |
| 4 | Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions. | L2,L3,L5, |
| 5 | Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios. | L1,L3,L6 |

**UNIT I Introduction to 3D Printing**
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

**UNIT II Solid and Liquid Based RP Systems**
Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

**UNIT III Powder Based & Other RP Systems**
Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).
Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

**UNIT IV Rapid Tooling & Reverse Engineering**
Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.
Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development
**UNIT V**

**Errors in 3D Printing and Applications:**
Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

**Textbooks:**
1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, 2/e, 2010.

**Reference Books:**
1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, "Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

**Online Learning Resources**:
- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-
- %20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdfcompressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4.

**IV B.Tech I Sem**　　　　　　　　　　　　　**L – T – P – C**　　　　**3 – 0 – 0 – 3**

### 23A04503T　　MICROPROCESSORS AND MICROCONTROLLERS
### (Open Elective –III)

**Course Objectives:**

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

**Course Outcomes:**
**At the end of this course, the students will be able to**

1. Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
2. Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

**UNIT I**

**8086 Architecture**: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

**UNIT II**

**8086 Programming**: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

**UNIT III**

**8086 Interfacing**: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

**UNIT IV**

Microcontroller - Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

**UNIT V**

Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory

Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

**Textbooks**:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3$^{rd}$ edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2$^{nd}$ edition, Pearson, 2012.

**References:**

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6$^{th}$ edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3$^{rd}$ edition, Cengage Learning, 2004.

**IV B.Tech-I Sem**

| 23A05402T | **DATA BASE MANAGEMENT SYSTEM** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | **(Open Elective-III)** | **3** | **0** | **0** | **3** |

**Course Objectives: T**he main objective of the course is to
- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**Course Outcomes:**After completion of the course, students will be able to
- Understand the basic concepts of database management systems (L2)
- Analyze a given database application scenario to use ER model for conceptual design of the database (L4)
- Utilize SQL proficiently to address diverse query challenges (L3).
- Employ normalization methods to enhance database structure (L3)
- Assess and implement transaction processing, concurrency control and database recovery protocols in databases. (L4)

**UNIT I: Introduction:** Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.
**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

**Unit II: Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

**UNIT III: SQL:** Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

**UNIT IV: Schema Refinement (Normalization):**Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

**UNIT V: Transaction Concept:** Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.
**Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing:

**Textbooks:**
1. Database Management Systems, 3$^{rd}$ edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts,5$^{th}$ edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

**Reference Books:**
1. Introduction to Database Systems, 8$^{th}$edition, C J Date, Pearson.
2. Database Management System, 6$^{th}$ edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**Web-Resources:**
1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202 2456_shared/overview

**IV B.Tech-I Sem**

| 23A38502 | **INTRODUCTION TO CYBER SECURITY** **(Open Elective-III)** | **L** | **T** | **P** | **C** |
|----------|---|---|---|---|---|
|          |                                                             | **3** | **0** | **0** | **3** |

**Course Objectives:**

1. To introduce the concept of cybercrime and its impact on information security, and provide an overview of cybercriminal behavior and various classifications of cybercrimes.
2. To explore the methodologies used by cybercriminals to plan and execute attacks, including techniques like social engineering, botnets, and cloud-related threats.
3. To understand the security risks associated with mobile and wireless devices, and examine countermeasures for securing mobile computing in organizational environments.
4. To familiarize students with the tools and techniques used in committing cybercrimes, such as phishing, malware, DoS/DDoS attacks, and code-based exploits.
5. To analyze the implications of cybercrime for organizations, including the cost of cyber attacks, intellectual property issues, and challenges posed by social computing and web-based threats.

**Course Outcomes:**

After completion of the course, students will be able to

1. Understand the fundamentals of cybercrime and information security, and explain the legal and global perspectives, especially with reference to Indian IT Act 2000.
2. Analyze how cybercriminals plan and execute cyber offenses using techniques like social engineering, cyber stalking, and botnets, including threats posed by cloud computing.
3. Evaluate the security challenges of mobile and wireless devices and formulate measures to secure mobile environments within an organization.
4. Identify and explain various cyber attack tools and methods such as phishing, keyloggers, Trojans, and SQL injection used in committing cybercrimes.
5. Assess the organizational implications of cybercrimes, including IPR issues, social media risks, and formulate strategies to mitigate security and privacy challenges.

**UNIT I Introduction to Cybercrime**

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**UNIT II Cyber Offenses: How Criminals Plan Them**

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

**UNIT III Cybercrime: Mobile and Wireless Devices**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones,

Mobile Devices:

Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

## UNIT IV Tools and Methods Used in Cybercrime

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

## UNIT V Cyber Security: Organizational Implications

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**Textbooks:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

**Reference Books:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group

**Online Learning Resources:**

*http://nptel.ac.in/courses/106105031/40*

*http://nptel.ac.in/courses/106105031/39*

*http://nptel.ac.in/courses/106105031/38*

**IV B.Tech I Sem**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### 23A54701        WAVELET TRANSFORMS AND ITS APPLICATIONS
### (Open Elective-III)

**Course Outcomes:**
**After successful completion of this course, the students should be able to:**

| COs | Statements | Blooms level |
|---|---|---|
| CO1 | Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms | L2, L3 |
| CO2 | Illustrate the multi resolution analysis ad scaling functions | L3, L5 |
| CO3 | Implement discrete wavelet transforms with multirate digital filters | L3 |
| CO4 | Understand multi resolution analysis and identify various wavelets and evaluate their time- frequency resolution properties. | L2, L3 |
| CO5 | Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields | L3,L5 |

Course Articulation Matrix:

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 |
| **CO2** | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 |
| **CO3** | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 |
| **CO4** | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 |
| **CO5** | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 |

1-Slightly,        2-Moderately,   3-Substantially.

### UNIT – I: Wavelets                                                          (08)

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.

### UNIT – II: A Multiresolution Formulation of Wavelet Systems                (08)

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

### UNIT – III   Filter Banks and the Discrete Wavelet Transform              (08)
Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

**UNIT – IV Time-Frequency and Complexity**                                   **(08)**

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform-Numerical Complexity of the Discrete Wavelet Transform.

**UNIT-V Bases and Matrix Examples**                                          **(08)**

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

**TEXT BOOK:**

1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999)..

**REFERENCES:**

1. RaghuveerRao, "Wavelet Transforms", Pearson Education, Asia

2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

1. http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html

2. http://www.wavelet.org/

3. http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm

4. https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-of-waveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf

**IV B.Tech I Sem**

| 23A56701a | **SMART MATERIALS AND DEVICES**<br>(Common to all branches)<br>**Open Elective-III** | Credits<br>3-0-0:3 |
|---|---|---|

| **Course Objectives** | |
|---|---|
| 1 | To provide exposure to smart materials and their engineering applications. |
| 2 | To impart knowledge on the basics and phenomenon behind the working of smart materials |
| 3 | To explain the properties exhibited by smart materials |
| 4 | To educate various techniques used to synthesize and characterize smart materials |
| 5 | To identify the required smart material for distinct applications/devices |

**UNIT   I Introduction to Smart Materials                                              9H**
Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).

**UNIT   II Properties of Smart Materials                                              9H**
Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

**UNIT   III Synthesis of Smart Materials                                              9H**
Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

**UNIT   IV   Characterization Techniques                                              9H**
Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

**UNIT   V Smart Materials based Devices                                              9H**
Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

**Textbooks:**

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

**Reference Books:**

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014
3. **Handbook of Smart Materials, Technologies, and Devices: Applications of Industry,4.0,**Chaudhery
MustansarHussain, Paolo Di Sia, Springer,2022.
4.**Fundamentals of Smart Materials,**Mohsen Shahinpoor, Royal Society of Chemistry, 2020

   **NPTEL course link: https://onlinecourses.nptel.ac.in/noc22_me17/preview**

| | Course Outcomes | Blooms Level |
|---|---|---|
| **CO1** | Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys. | L1,L2, L3, L4 |
| **CO2** | Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties. | L1,L2, L3 |
| **CO3** | Summarize various types of synthesis of smart materials | L1,L2, L3 |
| **CO4** | Analyze various characterization techniques used for smart materials | L1,L2, L3 |
| **CO5** | Interpret the importance of smart materials in various devices | L1,L2 |

**Course Articulation Matrix:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | | | | | | | |
| **CO2** | 3 | 3 | 2 | 1 | 1 | | | | | | | |
| **CO3** | 3 | 3 | 1 | 1 | 1 | | | | | | | |
| **CO4** | 3 | 2 | 1 | 1 | 1 | | | | | | | |
| **CO5** | 3 | 3 | 1 | 1 | - | | | | | | | |

1-Slightly,      2-Moderately, 3-Substantially.

| 23A56701b | **INTRODUCTON TO QUANTUM MECHANICS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | Open Elective – III | **3** | **0** | **0** | **3** |

| | **COURSE OBJECTIVES** |
|---|---|
| 1 | To understand the fundamental differences between classical and quantum mechanics. |
| 2 | To study wave-particle duality, uncertainty principle, and their implications. |
| 3 | To learn and apply Schrödinger equations to basic quantum systems. |
| 4 | To use operator formalism and mathematical tools in quantum mechanics. |
| 5 | To explore angular momentum, spin and their quantum mechanical representations. |

UNIT- I:   PRINCIPLES OF QUANTUM MECHANICS
Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation.Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle.Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function ($\psi$), Orthogonal, Normalized and Orthonormal functions

UNIT- II:  ONE DIMENSIONAL PROBLEMS AND SOLUTIONS
Potential step – Reflection and Transmission at the interface.  Potential well: Square well potential with rigid walls, Square well potential with finite walls.  Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and  Harmonic oscillator, Energy eigen functions and eigen values.

UNIT-III:  OPERATOR FORMALISM
Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

UNIT- IV:  MATHEMATICAL TOOLS FOR QUANTUM MECHANICS
The concept of row and column matrices, Matrix algebra,Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT- V : ANGULAR MOMENTUM AND SPIN
Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half(1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and  Eigen values.


BOOKS FOR STUDY:
**1.** Quantum Mechanics. Vol 1, A. MessaiaNoth-Holland Pub. Co., Amsterdam,(1961).
**2.** A Text Book of Quantum Mechanics.  P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).
**3.** Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc.,London, (1960).
**4.** Quantum Mechanics.  S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).

REFERENCE BOOKS:
1. Quantum Mechanics. L.I. Schiff,  McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

| | CourseOutcomes<br>After completing this course, students will be able to: | Blooms Level |
|---|---|---|
| **CO1** | Explain the key principles of quantum mechanics and wave-particle duality | L1, L2 |
| **CO2** | Apply Schrödinger equations to solve one-dimensional quantum problems | L3, L4 |
| **CO3** | Solve quantum mechanical problems using operator and matrix methods. | L2, L4 |
| **CO4** | Evaluate quantum states using Dirac notation and expectation values. | L5 |
| **CO5** | Analyze angular momentum and spin systems using Pauli matrices and operators. | L4, L5 |

**NPTEL courses link** :

4. **https://archive.nptel.ac.in/courses/115/101/115101107/**
5. **https://archive.nptel.ac.in/courses/122/106/122106034/**
6. **https://nptel.ac.in/courses/115106066**

CourseArticulationMatrix:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 2 | | | | | | | |
| **CO2** | 3 | 2 | 2 | 1 | 1 | | | | | | | |
| **CO3** | 3 | 3 | 2 | 1 | 1 | | | | | | | |
| **CO4** | 3 | 3 | 3 | 2 | 3 | | | | | | | |
| **CO5** | 3 | 3 | 1 | 1 | 1 | | | | | | | |

1-Slightly, 2-Moderately, 3-Substantially.

**IV B.Tech I Sem**

| 23A51701 | **GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT** <br> (Common to all branches) <br> **Open Elective-III** | Credits <br> 3-0-0:3 |
| --- | --- | --- |

| Course Objectives | |
| --- | --- |
| 1 | **To Understand Principle And Concepts Of Green Chemistry.** |
| 2 | **To Understand The Types Of Catalysis And Industrial Applications.** |
| 3 | **To Apply Green Solvents In Chemical Synthesis.** |
| 4 | **To Enumerate Different Sourced Of Green Energy.** |
| 5 | **To Apply Alternative Greener Methods Foe Chemical Reactions** |

| Course Outcomes | |
| --- | --- |
| CO1 | Apply the Green chemistry Principles for day to day life as well as synthesis, describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling. |
| CO2 | Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis |
| CO3 | Demonstrate Green solvents and importance, Discuss Supercritical carbondioxide, Explain Supercritical water, recycling of green solvents. |
| CO4 | Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis. |
| CO5 | Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications. |

### Mapping between Course Outcomes and Programme Outcomes

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO1 | | | | | | | | | | | | |
| CO2 | | | | | | | | | | | | |
| CO3 | | | | | | | | | | | | |
| CO4 | | | | | | | | | | | | |
| CO5 | | | | | | | | | | | | |

## UNIT 1: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

## UNIT 2: CATALYSIS AND GREEN CHEMISTRY

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical

Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.

## UNIT 3:  GREEN SOLVENTS IN CHEMICAL SYNTHESIS

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recyling of green solvents.

## UNIT 4: EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy:  Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

## UNIT 5: ALTERNATIVE GREENER METHODS

Photochemical Reactions - Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

**Text Books :**

1. **M. Lancaster,  Green Chemistry An Introductory Text, Royal Society Of Chemistry, 2002.**

2.   **Paul T. Anastas And John C. Warner, Green Chemistry Theory And Practice, 4ᵗʰ Edition,**

     **Oxford University Press, Usa**

References :

1. **Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.**
2. **Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:**

     **Green Nanoscience, wiley-VCH, 2013.**

**IV B.Tech I Sem**

| Course Code | EMPLOYABILITY SKILLS | L | T | P | C |
|---|---|---|---|---|---|
| 23A52703 | OPEN ELECTIVE-III | 3 | 0 | 0 | 3 |

**Course Objectives:**
- To encourage all round development of the students by focusing on productive skills
- To make the students aware of Goal setting and writing skills
- To enable them to know the importance of presentation skills in achieving desired goals.
- To help them develop organizational skills through group activities

To function effectively with heterogeneous teams

| Course Outcomes (CO): | Blooms Level |
|---|---|
| CO1: Understand the importance of goals and try to achieve them | L1, L2 |
| CO2: Explain the significance of self-management | L1, L2 |
| CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes | L3 |
| CO4: Analyse various forms of Presentation skills | L4 |
| CO5: Judge the group behaviour appropriately | L5 |
| CO6: Develop skills required for employability. | L3, L6 |

| UNIT - I | Goal Setting and Self-Management | Lecture Hrs |
|---|---|---|

Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis

| UNIT - II | Writing Skills | Lecture Hrs |
|---|---|---|

Definition, significance, types of writing skills – Resume writing Vs CV Writing -  E-Mail writing, Cover Letters  - E-Mail Etiquette -SoP (Statement of Purpose)

| UNIT - III | Technical Presentation Skills | Lecture Hrs |
|---|---|---|

Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

| UNIT - IV | Group Presentation Skills | Lecture Hrs |
|---|---|---|

Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation-Group Discussion-Debate –Corporate Etiquette

| UNIT - V | Job Cracking Skills | Lecture Hrs |
|---|---|---|

Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews

**Textbooks:**

1. Sabina Pillai, Agna Fernandez. *Soft Skills & Employability Skills,*2014.Cambridge Publisher.

2.Alka Wadkar. Life Skills for Success,  Sage Publications, 2016.

**Reference Books**:
1. **Gangadhar Joshi.** *Campus to Corporate Paperback* **, Sage Publications. 2015**
2. Sherfield Montogomery Moody,*Cornerstone Developing Soft Skills*, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. *Personality Development and Soft Skills - Preparing for Tomorrow* .1 Edition, Wiley, 2017.
4. M. Sen Gupta, *Skills for Employability,* Innovative Publication, 2019.
5. Steve Duck and David T McMahan*, The Basics f Communication Skills A Relational Perspective,* Sage press, 2012.

Online Learning Resources:
1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. https://www.youtube.com/c/skillopedia/videos
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. https://archive.nptel.ac.in/courses/109/107/109107172/#
9. https://archive.nptel.ac.in/courses/109/104/109104107/

**IV B.Tech – I Semester**

| Course Code | GEO-SPATIAL TECHNOLOGIES | L | T | P | C |
|---|---|---|---|---|---|
| **23A01705a** | **(OPEN ELECTIVE – IV)** | 3 | 0 | 0 | 3 |

Course Objectives:

**The objectives of this course are to make the student :**
1. To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. To analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. To evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. To assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

Course Outcomes:

Upon successful completion of the course, students will be able to:
1. Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. Evaluate surface andgeostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

CO – PO Articulation Matrix

| Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | 2 | - | - | - | - | - | - | - | 3 | 3 |
| **CO -2** | 3 | 3 | - | - | 2 | - | - | - | - | - | - | 2 | 3 | 3 |
| **CO -3** | 3 | - | 3 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 |
| **CO -4** | - | - | 3 | 3 | 3 | - | 2 | - | - | - | - | - | 3 | 3 |
| **CO -5** | - | - | - | - | 3 | 3 | 3 | 2 | - | - | - | - | 3 | 3 |

| **UNIT – I** | | |
|---|---|---|

**RASTER ANALYSIS**

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

| UNIT – II | | |
|---|---|---|

**VECTOR ANALYSIS**

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

| UNIT – III | | |
|---|---|---|

**NETWORK ANALYSIS**

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in  A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

| UNIT – IV | | |
|---|---|---|

**SURFACE and GEOSTATISTICAL ANALYSIS**

Surface Data – Sources of X,Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

| UNIT – V | | |
|---|---|---|

**CUSTOMISATION, WEB GIS, MOBILE MAPPING**

Customisation of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications-Location Based Services: Emergency and Business Solutions - Big Data Analytics.

**TEXT BOOKS:**

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. andYeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

**REFRENCE BOOKS:**

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, "An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

**Online Learning Resources:**

**https://archive.nptel.ac.in/courses/105/105/105105202/**
**https://onlinecourses.nptel.ac.in/noc19_cs76/preview**

**IV B.Tech – I Semester**

| Course Code | SOLID WASTE MANAGEMENT (OPEN ELECTIVE – IV ) | L | T | P | C |
|---|---|---|---|---|---|
| **23A01705b** | | 3 | 0 | 0 | 3 |

Course Objectives:
**The objectives of this course are to make the student :**
1. To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. To analyze engineering systems for solid waste collection, storage, and transportation.
3. To apply resource and energy recovery techniques for sustainable solid waste management.
4. To evaluate landfill design, construction, and environmental impact mitigation strategies.
5. To assess hazardous waste management techniques, including biomedical and e-waste disposal.

Course Outcomes:
1. Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.
2. Analyze engineering systems for solid waste collection, storage, and transportation.
3. Apply resource and energy recovery techniques for sustainable solid waste management.
4. Evaluate landfill design, construction, and environmental impact mitigation strategies.
5. Assess hazardous waste management techniques, including biomedical and e-waste

CO – PO Articulation Matrix

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO -1** | 3 | - | - | - | 2 | - | 2 | - | - | - | - | - | 3 | 3 |
| **CO -2** | 3 | 3 | - | - | 2 | - | 3 | - | - | - | - | 2 | 3 | 3 |
| **CO -3** | 3 | - | 3 | 2 | 3 | - | 3 | - | - | - | - | - | 3 | 3 |
| **CO -4** | - | - | 3 | 3 | 3 | - | 3 | 2 | - | - | - | - | 3 | 3 |
| **CO -5** | - | - | - | - | 3 | 3 | 3 | 3 | - | - | - | - | 3 | 3 |

| **UNIT – I** | | |
|---|---|---|

Solid Waste: Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016.

| **UNIT – II** | | |
|---|---|---|

Engineering SystemsforSolid Waste Management: Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques;

| **UNIT – III** | | |
|---|---|---|

Engineering Systems for Resource and Energy Recovery: Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems With Composing - Recovery of Thermal Conversion Products; Pyrolisis, Gasification, RDF - Recovery of Energy From

Conversion Products; Materials and Energy Recovery Systems.

**UNIT – IV**

Landfills: Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.

**UNIT – V**

Hazardous Waste Management: – Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management

**TEXT BOOKS:**

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

**REFRENCE BOOKS:**

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

**Online Learning Resources:**
**https://archive.nptel.ac.in/courses/105/103/105103205/**
**https://archive.nptel.ac.in/courses/120/108/120108005/**

**IV B.Tech I Sem**                     **L – T – P – C          3 – 0 – 0 – 3**

**23A02705          ELECTRIC VEHICLES**
**(Open Elective -IV)**

**Course Objectives:** To make the student
• Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.
• Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics.
• Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems.
•Design and analyze the various control structures for Electric vehicle.

**Course Outcomes (CO):** Student will be able to
CO 1:   To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs. -L2
CO 2:   Understand Various dynamics of Electric Vehicles. -L2
CO 3:   To remember and understand various configurations in parameters of EV system and dynamic aspects of EV. -L1
CO 4:   To analyze fuel cell technologies in EV and HEV systems. -L3
CO 5:   To analyze the battery charging and controls required of EVs. -L3

**UNIT I Introduction to EV Systems and Energy Sources:**
Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs-  EV configuration-  EV system- Fixed and Variable gearing- Single and multiple motor drive-  In-wheel drives-  EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment-  History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

**UNIT II EV Propulsion and Dynamics:**
Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi-motor configurations- Fixed and variable geared transmission- In-wheel motor configuration-Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.

**UNIT III Fuel Cells:**
Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

**UNIT IV Battery Charging and Control:**
Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging-Power factor correction.
Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach-PI controller's designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

**UNIT V Energy Storage Technologies:**
Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA
**Textbooks:**

1.C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition

2.Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, 2017,1st Edition

**Reference Books:**

1.Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.

2.Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt," Energy Storage in Power Systems" Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition

3.A.G.Ter-Gazarian, "Energy Storage for Power Systems", the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.

4.Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Elelctric, Hybrid Elelctric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004,1st Edition

5.James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003,2nd Edition.

**Online Learning Resources:**
1.      https://nptel.ac.in/courses/108/102/108102121/
2.      https://nptel.ac.in/syllabus/108103009

**IV B.Tech I Sem**                        **L – T – P – C          3 – 0 – 0 – 3**


**23A03705      TOTAL  QUALITY  MANAGEMENT**
**(Open Elective-IV).**

| Course objectives: Theobjectives of the courseareto | |
|---|---|
| 1 | Familiarize the basic concepts of Total Quality Management. |
| 2 | Expose with various quality issues in Inspection. |
| 3 | Gain Knowledge on quality control and its applications to real time.. |
| 4 | Understand the extent of customer satisfaction by the application of various quality concepts. |
| 5 | Demonstrate the importance of Quality standards in Production |


| Course Outcomes:Onsuccessfulcompletionofthecourse, thestudentwillbeable to, | | |
|---|---|---|
| 1 | Define and develop on quality Management philosophies and analyze quality costs frameworks. | L1,L3,L4 |
| 2 | Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies. | L2, L3,L6 |
| 3 | Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement. | L2,L4,L5 |
| 4 | Apply benchmarking and business process reengineering to improve management processes. | L3,L5,L6 |
| 5 | Demonstrate the set of indications to evaluate performance excellence of an organization | L1,L2,L5 |

**UNIT – I      Introduction:**
Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

**UNIT - II      Historical Review:**
Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

**UNIT – III      TQM Principles:**
Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies.

**UNIT - IV      TQM Tools:**
Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

**UNIT – V      Quality Systems**:
Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.
**Text Books:**
1.Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.

2.Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.
3.Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017.

**Reference Books:**
1.Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2.Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3.Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4.Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

**Online Learning Resources:**

- https://www.youtube.com/watch?v=VD6tXadibk0
- https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
- https://blog.capterra.com/what-is-total-quality-management/
- https://nptel.ac.in/courses/110/104/110104080/
- https://onlinecourses.nptel.ac.in/noc21_mg03/preview
- https://nptel.ac.in/courses/110/104/110104085/
- https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

**IV B.Tech I Sem**                          **L – T – P – C**          **3 – 0 – 0 – 3**

**23A04704**          **TRANSDUCERS AND SENSORS**
(Open Elective –IV)

## Course Objectives:

1. To understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. To provide knowledge on flow transducers and their applications.
4. To study the working principles of pressure transducers.
5. To introduce working principle and applications of force and sound transducers.

## Course Outcomes:

**After completing the course, the student will be able to,**

1. Understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. Gain knowledge on flow transducers and their applications.
4. Learn the working principles of pressure transducers.
5. Understand the working principle and applications of force and sound transducers.

## UNIT I

**Introduction:** General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

**Motion Transducers:** Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

## UNIT II

**Temperature Transducers:** Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.

Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

## UNIT III

**Flow Transducers:** Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

## UNIT IV

**Pressure Transducers:** Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

## UNIT V

**Force and Sound Transducers:** Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone**.**


**TEXT BOOKS**

1. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai& Co. 3$^{rd}$ edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, "Instrumentation Devices and Systems", TATA McGraw Hill publications, 2007.

**REFERENCE BOOKS**

1. Doebelin. E.O, "Measurement Systems Application and Design",McGraw Hill International, New York, 2004.
2. Nakra B.C andChaudharyK.K , "Instrumentation Measurement and Analysis", Second Edition, Tata McGraw-Hill Publication Ltd.2006.

**IV B.Tech I Sem**

| 23A05502T | **INTRODUCTION TO COMPUTER NETWORKS** **(Open Elective-IV)** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

## Course Objectives:

The course is designed to:

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

## Course Outcomes:

After completion of the course, students will be able to:

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop error, routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

## UNIT I:

**Computer Networks and the Internet**                        **Lecture: 8 Hrs**
What Is the Internet? Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks (Textbook 2), Reference Models, Multimedia Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)

## UNIT II:

**The Data Link Layer, Access Networks, and LANs**          **Lecture: 10 Hrs**
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page (Packet) (Textbook 2)

## UNIT III:

**The Network Layer**                                  **Lecture: 8 Hrs**
Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)

## UNIT IV:

**The Transport Layer**                                     **Lecture: 9 Hrs**
Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)

## UNIT V:

**The Application Layer**                                     **Lecture: 8 Hrs**
Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks (Textbook 2)

## Textbooks:

1. Andrew S. Tanenbaum, David J. Wetherall, *Computer Networks*, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, *Computer Networking: A Top-Down Approach*, 6th Edition, Pearson, 2019.

## Reference Books:

1. Forouzan, *Data Communications and Networking*, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akhtar, *Networks for Computer Scientists and Engineers*, Oxford Publishers, 2016.

## Online Learning Resources:

1. https://nptel.ac.in/courses/106105183/25
2. https://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

**IV B.Tech I Sem**

| 23A35501T | INTERNET OF THINGS (Open Elective-IV) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:**

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

**Course Outcomes:**
After completion of the course, students will be able to

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

**UNIT I   Introduction to IoT**
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

**UNIT II Prototyping IoT Objects using Microprocessor/Microcontroller**
Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

**UNIT III     IoT Architecture and Protocols**
Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

**UNIT IV    Device Discovery and Cloud Services for IoT**
Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

**UNIT V     UAV IoT**
Introduction toUnmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

**Textbooks:**

3. Vijay Madisetti and ArshdeepBahga, " Internet of Things ( A Hands-on-Approach)", 1st Edition, VPT, 2014.
4. Handbook of unmanned aerial vehicles, K Valavanis;George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

**Reference Books:**

8. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, " From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
9. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
10. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman,  CRC Press.
11. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
12. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 9781-4493- 9357-1
13. DGCA RPAS Guidance Manual, Revision 3 – 2020
14. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs,  John Baichtal

**Online Learning Resources:**

5. *https://www.arduino.cc/*
6. *https://www.raspberrypi.org/*
7. *https://nptel.ac.in/courses/106105166/5*
8. *https://nptel.ac.in/courses/108108098/4*

| 23A32603 | **INTRODUCTION TO QUANTUM COMPUTING** | L | T | P | C |
| | <u>**Open Elective – IV**</u> | 3 | 0 | 0 | 3 |

**Course Objectives***:*

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

*Course Outcomes***:**

Upon successful completion of this course, students will be able to:

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

*UNIT I: Fundamentals of Quantum Mechanics and Linear Algebra*

Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

*UNIT II: Quantum Gates and Circuits*

Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

*UNIT III: Quantum Algorithms and Complexity*

Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

*UNIT IV: Quantum Programming and Simulation Platforms*

Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

*UNIT V: Applications and Future of Quantum Computing*

**Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.**

*Textbooks***:**

4. Michael A. Nielsen, Isaac L. Chuang, <u>Quantum Computation and Quantum Information</u>, Cambridge University Press, 10th Anniversary Edition, 2010.
5. Eleanor Rieffel and Wolfgang Polak, <u>Quantum Computing: A Gentle Introduction</u>, MIT Press, 2011.
6. Chris Bernhardt, <u>Quantum Computing for Everyone</u>, MIT Press, 2019.

*Reference Books***:**

4. David McMahon, <u>Quantum Computing Explained</u>, Wiley, 2008.
5. Phillip Kaye, Raymond Laflamme, Michele Mosca, <u>An Introduction to Quantum Computing</u>, Oxford University Press, 2007.
6. Scott Aaronson, <u>Quantum Computing Since Democritus</u>, Cambridge University Press, 2013.

*Online Learning Resources***:**

1. **IBM Quantum Experience and Qiskit Tutorials**
2. **Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley**
3. edX – The Quantum Internet and Quantum Computers
4. **YouTube – Quantum Computing for the Determined by Michael Nielsen**
5. Qiskit Textbook – IBM Quantum

**IV B.Tech I Sem**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### 23A54702      FINANCIAL MATHEMATICS
### (Open Elective-IV)

**Course Objectives:**

1. To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
2. To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
3. To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
4. To equip students with computational techniques for pricing financial derivatives.

**Course Outcomes:**

**After successful completion of this course, the students should be able to:**

| COs | Statements | Blooms level |
|---|---|---|
| CO1 | Explain fundamental financial concepts, including arbitrage, valuation, and risk. | L2 (Understand) |
| CO2 | Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts. | L3 (Apply) |
| CO3 | Analyze mathematical techniques for pricing options and financial derivatives. | L4 (Analyze) |
| CO4 | Evaluate interest rate models and bond pricing methodologies. | L5 (Evaluate) |
| CO5 | Utilize computational techniques such as Monte Carlo simulations for financial modeling. | L3 (Apply) |

## Course Articulation Matrix:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | 1 | - | - | - | - | - | 2 | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 1 | - | - | - | - | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 1 | - | - | - | - | - | 2 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 2 | 2 |

• **3** = Strong Mapping, **2** = Moderate Mapping, **1** = Slight Mapping, **-** = No Mapping

**UNIT-I: Asset Pricing and Risk Management**            **(08)**

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

**UNIT-II: Stochastic Models in Finance** **(08)**

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito's Lemma, Ito Integral, and Ito Isometry.

**UNIT-III: Interest Rate and Credit Modelling** **(08)**

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

**UNIT-IV: Fixed-Income Securities and Bond Pricing** **(08)**

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.

**UNIT-V: Exotic Options and Computational Finance** **(08)**

Stochastic volatility models and the Feynman-Kac theorem.Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

**Textbooks:**

1. Ales Cerny, *Mathematical Techniques in Finance: Tools for Incomplete Markets*, Princeton University Press.

2. S.R. Pliska, *Introduction to Mathematical Finance: Discrete-Time Models*, Cambridge University Press.

**Reference Books:**

1. IoannisKaratzas& Steven E. Shreve, *Methods of Mathematical Finance*, Springer, New York.

2. John C. Hull, *Options, Futures, and Other Derivatives*, Pearson.

**Web References:**

• MIT– Mathematics for Machine Learning https://ocw.mit.edu

• Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/

• National Stock Exchange (NSE) India – Financial Derivatives https://www.nseindia.com/

**IV B.Tech I Sem**

| 23A56702 | SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (Open Elective-IV) (Common to all branches) | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

| | COURSE OBJECTIVES | | | |
|---|---|
| 1 | To provide exposure to various kinds of sensors and actuators and their engineering applications. |
| 2 | To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators |
| 3 | To explain the operating principles of various sensors and actuators |
| 4 | To educate the fabrication of sensors |
| 5 | To explain the required sensor and actuator for interdisciplinary application |

**UNIT I Introduction to Sensors and Actuators                               9H**

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.
Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

**UNIT II Temperature and Mechanical Sensors                               9H**

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors
Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

**UNIT III Optical and Acoustic Sensors                               9H**

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles
Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

**UNIT IV Magnetic and Electromagnetic Sensors                               9H**

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

**UNIT V Chemical and Radiation Sensors                               9H**

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.
Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

**Textbooks:**
1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

**Reference Books:**
1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

**NPTEL course link: https://onlinecourses.nptel.ac.in/noc21_ee32/preview**

| | Course Outcomes | Blooms Level |
|---|---|---|
| **CO1** | Classify different types of Sensors and Actuators along with their characteristics | L1,L2 |
| **CO2** | Summarize various types of Temperature and Mechanical sensors | L1,L2 |
| **CO3** | Illustrates various types of optical and mechanical sensors | L1,L2 |
| **CO4** | Analyze various types of Optical and Acoustic Sensors | L1,L2, L3 |
| **CO5** | Interpret the importance of smart materials in various devices | L1,L2 |

**Course Articulation Matrix**:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | | | | | | | |
| **CO2** | 3 | 3 | 2 | 1 | 1 | | | | | | | |
| **CO3** | 3 | 3 | 1 | 1 | 1 | | | | | | | |
| **CO4** | 3 | 2 | 1 | 1 | - | | | | | | | |
| **CO5** | 3 | 3 | 1 | 1 | - | | | | | | | |

1-Slightly, 2-Moderately, 3-Substantially.

**IV B.Tech I Sem**

| 23A51702 | CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (Open Elective-IV) (Common to all branches) | L | T | P | C |
|---|---|---|---|---|---|
|  |  | 3 | 0 | 0 | 3 |

| Course Objectives | |
|---|---|
| 1 | To understand basics and characterization of nanomaterials. |
| 2 | To understand synthetic methods of  nanomatrials. |
| 3 | To apply various techniques for charterization of nanomaterials. |
| 4 | To understand Studies of Nano-structured Materials |
| 5 | To enumerate the applications of advanced nanomaterials in engineering |

| Course Outcomes | |
|---|---|
| CO1 | Classify the nanostructure materials; describe scope of nanoscience and importance technology. |
| CO2 | Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling. |
| CO3 | Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis. |
| CO4 | Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials. |
| CO5 | Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation. |

### Mapping between Course Outcomes and Programme Outcomes

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |  |  |  |  |  |

## Unit – I

**Basics and Characterization of Nanomaterials:** Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

## Unit – II

**Synthesis of nanomaterials :**Top-Down approach**,**  Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, highenergy ball milling method.

Synthetic Methods**:** Bottom-Up approach**,** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

## UNIT-III

**Techniques for characterization:** Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

## UNIT-IV

**Studies of Nano-structured Materials:** Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

## UNIT-V

**Advanced Engineering Applications of Nanomaterials:**  Applications of  Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

## TEXT BOOKS:

1. **NANO: The Essentials:** T Pradeep, MaGraw-Hill, 2007.
2. **Textbook of Nanoscience and nanotechnology:** B S Murty, P Shankar, BaldevRai,     BB Rath and James Murday, Univ. Press, 2012.

## REFERENCE BOOKS:

1. Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. **Nanostructures &Nanomaterials; Synthesis, Properties & Applications:** Guozhong Cao, Imperial College Press, 2007.

   **Nanomaterials**

**IV B.Tech I Sem**

| 23A52704 | LITERARY VIBES<br>(Open Elective-IV) | L | T | P | C |
|---|---|---|---|---|---|

| Course Objectives | |
|---|---|
| 1 | To inculcate passion for aesthetic sense and reading skills |
| 2 | To encourage respecting others' experiences and creative writing |
| 3 | To explore emotions, communication skills and critical thinking |
| 4 | To educate  how books serve as the reflection of history and society |
| 5 | To provide practical wisdom and duty of responding to events of the times |

| | Course Outcomes | Blooms Level |
|---|---|---|
| CO1 | Identify genres, literary techniques and creative uses of language in literary texts. | L1, L2 |
| CO2 | Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces | L1, L2 |
| CO3 | Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments | L3 |
| CO4 | Analyze the underlying meanings of the text by using the elements of literary texts | L4 |
| CO5 | Evaluate their own work and that of others critically | L5 |
| CO6 | Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance | L3 |

**UNIT I: Poetry**

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

**UNIT II: Drama: *Twelfth Night*- William Shakespeare**

1. Shakespeare -life and works
1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

**UNIT III: Short Story**

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

**UNIT IV: Prose: Essay and Autobiography**

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

**UNIT V:  Novel: *Hard Times*- Charles Dickens**

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

## Text Books:

1. Charles Dickens**.***Hard Times.*(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.*William Shakespeare. Twelfth Night***.** Oxford University Press,2016.

## References:

1. WJ Long.*History of English Literature***,** Rupa Publications India; First Edition (4 October 2015)
2. RK Kaushik And SC Bhatia. *Essays, Short Stories and One Act Plays*, Oxford University Press .2018.

3. Dhanvel, SP. *English and Soft Skills*, Orient Blackswan,2017.
*4. New Horizon*, Pearson publications, New Delhi 2014
5. Vimala Ramarao, *Explorations Volume*-II,  Prasaranga Bangalore University,2014**.**
*6.* Dev Neira, Anjana & Co. *Creative Writing: A Beginner's Manual.*Pearson India, 2008.

## Online Resources

**https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses**
**https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis**
**https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette**
**https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/**
**https://www.litcharts.com/lit/twelfth-night/themes**
**https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/**

# HONOURS

| | | L | T | P | C |
|---|---|---|---|---|---|
| 23A35H01 | **COMMUNICATION PROTOCOLS FOR IOT** | 3 | 0 | 0 | 3 |

**Course Objectives:** In this course, learners will be going to learn about various protocols designed for the implementation of the Internet of Things (IoT) applications.

**Course Outcomes:**

1.Understand fundamentals of IoT architecture outline and standards.

2.Understand and analyze different architectural views.

3.Understand the importance of IoT Data Link Layer & Network Layer Protocols.

4.Understand the importance of Iot Transport & Session Layer Protocols.

**UNIT - I**

Introduction: IoT architecture outline, standards - IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics.

**Unit - II**

Iot Reference Architecture: Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant Architectural views. Real-World Design Constraints- Introduction, Technical Design constraints.

**UNIT - III**

IoT Data Link Layer: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7

**UNIT - IV**

Network Layer Protocols: Network Layer-IPv4,IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

**UNIT - V**

IOT Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

**TEXT BOOKS:**
1.  Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications ,2016
2.  Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1st Edition, Academic Press, 2015.

**REFERENCE BOOKS:**
1.  Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-64219156-5 e-ISBN 978-3-642-19157-2, Springer, 2016.
2.  N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

| | | L | T | P | C |
|---|---|---|---|---|---|
| 23A35H02 | **INTRODUCTION TO UAV** | 3 | 0 | 0 | 3 |

**Course Objectives:**
- To make the students to understand the basic concepts of UAV systems design.
- Understand the capabilities and limitations of the UAS and data post-processing systems; • Understand fundamental concepts surrounding operating a UAS
- A thorough understanding of aircraft flight dynamics.
- Understanding the static stability of various UAVs. Significance of location of Neutral point and Centre of gravity for a stable flight.

**Course Outcomes:**
- Ability to design UAV system
- Ability to identify different hardware for UAV
- Evaluate strength and weakness of different phases of the design
- Design example for hand launch fixed wing UAV for various mission requirement □ Develop subroutine for design process.

**UNIT I**                                                      Lecture 8 Hrs

**History and Overview:** Overview, history, overview of UAV Systems, The Aquila.

Classes and Missions of UAVs: Overview, Examples of UAV Systems, Expendable UAVs, Classes of UAV Systems, Missions.

**UNIT II**                                                     Lecture 8 Hrs

**Mission Planning and Control Station:** Overview, MPCS Architecture, Physical Configuration, Planning and Navigation, MPCS Interfaces.

Data-Link Functions and Attributes: Overview, Background, Data-Link Functions, Desirable Data-Link Attributes, System Interface Issues.

**UNIT III**                                                    Lecture 9 Hrs

**Introduction to Design and Selection of the System:** Conceptual Phase, Preliminary Design, Detail Design, Selection of the System.

**Communications:** Communication Media, Radio Communication, Mid-air Collision (MAC) Avoidance, communications Data Rate and Bandwidth Usage.

**Design for Reliability:** Determination of the Required Level of Reliability, Achieving Reliability, Reliability Data Presentation, Multiplexed Systems, Reliability by Design, Design for Ease of Maintenance.

**UNIT IV**                                                     Lecture 9 Hrs

**Introduction to System Development and Certification:**

System Development, Certification, Establishing Reliability.

**System Ground Testing:** UAV Component Testing, UAV Sub-assembly and Sub-system Testing, Testing Complete UAV, Control Station Testing, Catapult Launch System Tests, Documentation.

**System In-flight Testing:** Test Sites, Preparation for In-flight Testing, In-flight Testing, System Certification. **Civilian, Paramilitary and Commercial Roles**

**UNIT V**                                                                                     Lecture 8 Hrs

**Future Prospects and Challenges:** Introduction, Operation in Civilian Airspace, Power-plant Development, Developments in Airframe Configurations, Autonomy and Artificial Intelligence, Improvement in Communication Systems.

**UAV Systems Continuing Evolution:** Introduction, Cruise Missiles, World War II Systems, The 1950s, The 1960s, The 1970s, The 1980s, The 1990s, The 2000s, The 2010s, Into the Future.

**Textbooks:**
1. Paul GerinFahlstrom and Thomas James Gleason, Introduction to UAV Systems, Fourth Edition, Aerospace Series.
2. Reg Austin, UNMANNED AIRCRAFT SYSTEMS, UAVS DESIGN, DEVELOPMENT AND DEPLOYMENT, Aerospace Series, Ian Moir, Allan Seabridge and Roy Langton.

**Reference Books:**

1.Andey Lennon, "Basics of R/C Model Aircraft Design" Model Airplane News Publication
2.John Baichtal, Building Your Own Drones: A Beginners' Gide to Drones, UAVs, and ROVs.
3.K Valavanis,George J Vachtsevanos, Handbook of Unmanned Aerial    Vehicles, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
4.DGCA RPAS Guidance Manual, Revision 3 – 2020.

**Online Learning Resources:**
1. Edx: Drones for Agriculture: Prepare and Design Your Drone (UAV) Mission
2.Coursera: Robotic: Aerial Robotics

| | | L | T | P | C |
|---|---|---|---|---|---|
| 23A35H03 | **IOT INFRASTRUCTURE** | **3** | **0** | **0** | **3** |

**Course Objectives:**
- Study the real industrial environment
- Discuss case study of Google, AWS and AZURE
- Understand industrial data flow.

**Course Outcomes:**
- Understand the Industrial IoT
- Apply IoT techniques in Industrial IoT
- Use Google, AWS and AZURE for Industrial IoT

**UNIT-I Introduction to Industrial IoT and Process**                                    Lecture    8

Hrs

Technical requirements, IoT background, IoT key technologies, what is the I-IoT, use cse of the IoT and I-IoT similarities and differences, IoT analytics and AI, Industry environments and scenarios covered by I-IoT

Process - The Industrial Process, The CIM pyramid, The I-IoT data flow

**UNIT-II Industrial data flow and devices**                                             Lecture    8
Hrs

Technical requirements, The I-IoT data flow in the factory, Measurements and the actuator chain, controllers, Industrial protocols, Supervisory control and data acquisition, Historian, ERP and MES

**UNIT-III  Implementing the Industrial IoT data flow**                                  Lecture    9

Hrs

Discovering OPC, Understanding the I-IoT edge, Implementing the I-IoT data flow

**UNIT-IV: Implementing a cloud Industrial IoT solution with AWS** Lecture 9 Hrs

Technical requirements, AWS architecture, registering for AWS, IoT core, Storing data, AWS Analytics.

**UNIT-V Implementing a Cloud industrial IoT solution with Google cloud,**

        Lecture8Hrs AzureTechnical requirements, Google Cloud IoT, Starting with IoT core, Bigtable, Cloud Functions, GCP for analytics Technical requirements, Azure IoT, Azure analytics, Building visualizations with Power BI, Time series insights, Connecting a device with IoT Edge

**Textbooks:**
1.CiacomoVeneri and Antonio Capasso, Hands on Industrial Internet of Things, Packt Publisher, 2018

**Reference Books:**
1. Deep Learning for Internet of Things Infrastructure Edited ByUttam Ghosh, MamounAlazab, Ali Kashif Bas, First Edition.

2. Raffaele Giaffreda, Dagmar Caganova, Yong Li, Roberto Riggio, Agnes Voisard(Eds), Internet of Things. IoT Infrastructures, Second International Summit, IoT 360° 2015, Rome, Italy, October 2729, 2015, Revised Selected Papers, Part II.

**Online Learning Resources:**
1. NPTEL Course by SudipMisra, IIT Kharagpur

| 23A35H04 | **INDUSTRIAL IOT** | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**Course Objectives:**
- Acquire theoretical knowledge on Industrial Internet of Things.
- Apply suitable machine learning techniques for data handling and to gain knowledge from it.
- Evaluate the performance of algorithms for sensors and data transmission.

**Course Outcomes:**
- Understand the characteristics of Internet of Things and its industry strategies.
- Apply various Internet of Things models to appropriate problems.
- Identify and integrate more than one technology to enhance the performance.
- Understand the sensors and data transmission used in Internet of Things.
- Analyse the co-occurrence of data to find interesting frequent patterns.
- Pre-process the data before applying to any real-world problem and can evaluate its performance.

**UNIT-I**         **Overview of Internet of Things**

Introduction, IOT Architecture, Application –based IOT protocols, Cloud Computing, Fog Computing, Sensor Cloud, Big Data.

Overview of Industry 4.0 and Industrial Internet of Things: IIoT- Prerequisites of IIOT, Basics of CPS, CPS and IIOT, Applications of IIoT

**UNIT-II**         **Industrial Internet of Things**

Introduction, Industrial Internet Systems, Industrial sensing, Industrial sensing, Industrial Processes.

Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IOT, Business models of IIOT

**UNIT-III**         **Key and On-site Technologies**

Key Technologies: Off-site Technologies- Introduction, Cloud Computing- Necessity, Cloud Computing and IIot, Industrial Cloud Platform Providers, SLA, Requirements of Industry 4.0, Fog Computing.

On-site Technologies- Introduction, Augmented Reality- History, Categorization, Applications, Virtual Reality- History, Categorization, Applications.

**UNIT-IV**         **Sensors and Data Transmission**

Sensors: Introduction to Sensors, Characteristics-Sensor calibration, Sensor profile, Operating voltage, Sensor Categories.

Actuators: Introduction, Thermal Actuators, Hydraulic Actuators, Pneumatic Actuators, Electromechanical Actuators.

Industrial Data Transmission: Foundation fieldbus, Profibus, HART, Interbus, Bitbus.

**UNIT-V Machine learning and Data science, applications in healthcare**

Machine Learning and Data Science in Industries: Introduction, Machine Learning, Categorization on ML, Applications and Data Science of ML in industries, Deep Learning, Applications of Deep Learning in industries.

Applications of Healthcare in Industries: Smart Devices, Advanced Technologies using in Healthcare,

Open Research Issues to be Addressed.

**Textbooks:**
1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.

**Reference Books:**
1. Industrial IoT Available online https://medium.com/iotforall/whatproduct-managers-needto-know-about-industrial-iot-8c92eec1d9d2
2. IIoT Cloud Platforms. Available online: https://fr.farnell.com/willthere-be-a-dominant-iiotcloud-platform.
3. Kajima, T. and Kawamura, Y., 1995. Development of a high-speed solenoid valve: Investigation of solenoids. IEEE Transactions
   on industrial electronics, 42(1), pp.1-8.

**Online Learning Resources:**
1. https://www.coursera.org/learn/industrial-internet-of-things
2. https://www.coursera.org/specializations/developing-industrial-iot

| 23A32H04 | **DATA ANALYTICS** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| | | **3** | **0** | **0** | **3** |

**Course Objective:**

To equip students with foundational and applied knowledge in data management, analytics, and visualization, enabling them to design data architectures, process and analyze structured and unstructured data from diverse sources, apply statistical and machine learning models such as regression and segmentation, and effectively communicate insights using advanced data visualization techniques.

**Course Outcomes:**

After completion of this course students will be able to

1. Understand the impact of data analytics for business decisions and strategy
2. Carry out data analysis/statistical analysis
3. To carry out standard data visualization and formal inference procedures
4. To Understand various Data Sources
5. To understand various modelling techniques

Unit-1   Data Management:

Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

**Unit -2 Data Analytics:**

Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

**Unit -3Regression**

Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

**Unit – 4Object Segmentation:**

Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

**Unit – 5Data Visualization:**

Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**TEXT BOOKS:**

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, AddisionWisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. AnandRajaramanMilliway Labs Jeffrey D Ullman Stanford Univ.

| 23A35H05 | IOT COMMUNICATION PROTOCOLS LAB | L | T | P | C |
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Course Objectives:

To provide students with hands-on experience in designing and developing Internet of Things (IoT) applications using microcontrollers, sensors, wireless communication modules, and cloud platforms, enabling them to build intelligent systems with real-time data acquisition, processing, and connectivity.

**Course Outcomes:**
 **The students will be able to :**
1. Use microcontroller based embedded platforms in IOT
2. Use microprocessor based embedded platforms in IOT
3. Use wireless peripherals for exchange of data.
4. Make use of Cloud platform to upload and analyse any sensor data
5. Use of Devices, Gateways and Data Management in IoT.
6. Use the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.

 **List of Suggested Laboratory Experiments***:*

1. Introduction to Arduino platform and programming
2. Interfacing Arduino to Zigbee module
3. Interfacing Arduino to GSM module
4. Interfacing Arduino to Bluetooth Module
5. Introduction to Raspberry PI platform and python programming
6. Interfacing sensors to Raspberry PI
7. Communicate between Arduino and Raspberry PI using any wireless medium
8. Setup a cloud platform to log the data
9. Log Data using Raspberry PI and upload to the cloud platform
10. Design an IOT based system
11. The future of IOT with Bluetooth Role.
12. IOT Communication Protocol with Zigbee.
13. IOT Communication Protocol with Wi-Fi.

 **TEXTBOOK:**

1. **ArshdeepBahga and Vijay Madisetti**, *Internet of Things: A Hands-On Approach*, Universities Press, 2015.

 Reference Books:

1. **Pethuru Raj and Anupama C. Raman**, *The Internet of Things: Enabling Technologies, Platforms, and Use Cases*, CRC Press, 2017.
2. **Marco Schwartz**, *Internet of Things Projects with ESP8266*, Packt Publishing, 2017.

3. **Simon Monk**, *Programming Arduino: Getting Started with Sketches*, McGraw-Hill Education, 2016 (2nd Edition).
4. **Matt Richardson and Shawn Wallace**, *Getting Started with Raspberry Pi*, O'Reilly Media, 2016 (3rd Edition).

| 23A32H05 | DATA ANALYTICS LAB | L | T | P | C |
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Course Objectives:

To equip students with the knowledge and skills to acquire, manage, analyze, model, and visualize data from diverse sources using modern tools and techniques, enabling effective decision-making through data-driven insights.

**Course Outcomes (COs):**

By the end of this course, students will be able to:

**CO1:** Acquire and manage data from various sources, ensuring quality through effective preprocessing.

**CO2:** Perform data cleaning, transformation, and exploratory analysis using appropriate libraries and tools.

**CO3:** Build and interpret regression models (linear, polynomial, logistic) and apply regularization to handle overfitting.

**CO4:** Apply segmentation and clustering algorithms for pattern recognition and prediction in business and multimedia domains.

**CO5:** Design effective data visualizations, including 2D/3D and hierarchical visualizations, to explore and present data insights clearly.

**List of Eceriments:**

1. **Data Acquisition and Storage**
   o Read and store data from **CSV, JSON, and SQL databases** using pandas.
2. **Handling Missing Data**
   o Identify and handle **missing values** using **imputation techniques** (mean, median, mode).
3. **Data Cleaning and Preprocessing**
   o Detect and remove **duplicates, outliers, and inconsistencies** using numpy and pandas.
4. **Data Transformation and Normalization**
   o Apply **scaling techniques (MinMax, StandardScaler)** using scikit-learn.
5. **Working with Sensor Data**
   o Process **IoT sensor data** from **GPS, signals, and time-series logs**.
6. **xploratory Data Analysis (EDA)**

   • Use matplotlib, seaborn, and pandas-profiling for data visualization and summary statistics.

7. **Feature Engineering**

   • Create **new features** using transformation techniques (log, polynomial, binning).

8. **Implementation of Multiple Linear Regression**

- Use statsmodels and scikit-learn to fit **regression models** and analyze assumptions.

9. **Polynomial Regression**

   - Implement polynomial regression to capture **non-linearity in data**.

10. **Regularization Techniques**

    - Apply **Lasso and Ridge regression** to prevent overfitting.

11. **Logistic Regression for Classification**

    - Implement and evaluate **logistic regression** on a real dataset.

12. **K-Means Clustering for Image Segmentation**

    - Perform **unsupervised segmentation** on images using OpenCV and scikit-learn.

13. **Decision Tree for Classification**

    - Build a **classification tree** to predict categories from structured data.

14. **Random Forest for Feature Selection**

    - Use **feature importance scores** to identify key predictors.

15. **3D Data Visualization**

    - Use plotly and matplotlib for **3D scatter plots** and **surface plots**.

16. **Hierarchical Data Visualization**

    - Create **tree maps and dendrograms** for hierarchical data.

**Text Books:**

**1. VigneshPrajapati**, *Big Data Analytics with R and Hadoop*, Packt Publishing, 2013.

**Reference Books:**

1. **Wes McKinney**, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O'Reilly Media, 2017 (2nd Edition).

2. **Trevor Hastie, Robert Tibshirani, Jerome Friedman**, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer, 2009 (2nd Edition).

3. **Toby Segaran**, Programming Collective Intelligence, O'Reilly Media, 2007.

4. **Alberto Cairo**, The Truthful Art: Data, Charts, and Maps for Communication, New Riders, 2016.